IS IT ALL IN THE TELLING?: A STUDY OF THE ROLE OF TEXT SCHEMAS AND SCHEMATIC TEXT STRUCTURES IN THE RECALL AND COMPREHENSION OF PRINTED NEWS STORIES

By

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For Frank

and for the rest of my wonderful family.

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IS IT ALL IN THE TELLING?: A STUDY OF THE ROLE OF TEXT SCHEMAS AND SCHEMATIC TEXT STRUCTURES IN THE RECALL AND COMPREHENSION OF PRINTED NEWS STORIES

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On the basis of schema-theoretic approaches to the reading process, this study focused on the extent to which the underlying structure of news stories and readers' schemas for text structures affect the comprehension and recall of the stories' content.

Because readers' awareness of text structures has been shown to influence their cognitive processing of text content, it was hypothesized that altering a news story so that the text conformed to a more familiar structure might increase comprehension and recall.

Two stimulus news passages were rewritten twice--once to conform to a story grammar and once to conform to an expository/attribution text structure. Subjects (n=104) read a stimulus passage, performed distractor tasks

including a measure of the strength of the subject's schema for the stimulus passage's text structure, and then responded to measures of free short-term and long-term recall and comprehension.

Readers were found to have significantly higher short-term recall of the narrative and expository versions of both text passages than the news stories, F (2,50) = 2.881, p = 0.065 for Passage I and F (2,45) = 3.529, p = 0.038 for Passage II. However, subjects' comprehension of the two passages did not appear to be significantly affected by the experimental manipulation overall, F (2,50) = 1.985, p = 0.148 in the case of Passage I, and F (2,45) = 0.179, p = 0.836 in the case of Passage II. Long-term recall was significantly affected by alteration of text structure for Passage I, F (2,35) = 3.102, p = .057, but not for Passage II, F (2,25) = 0.907, p = 0.416.

Subjects' interest in the topic of the passage was found to influence comprehension in the case of Passage I (t = 2.36, p = 0.011) but not for Passage II (t = 1.21, p = 0.116).

CHAPTER 1
GENERAL INTRODUCTION

News writing has traditionally aimed at presenting information in a clear, concise manner designed to render the news content of a story accessible to as large a number of readers as possible (McCombs & Becker, 1979, p. 18). Reporters are exhorted to write simply and clearly, using short sentences and familiar words (cf. Berner, 1984; Hutchison, 1986; Jones, 1978). Mencher (1984) notes, "News is information people need in order to make rational decisions about their lives" (p. 77). If the information is meant to be useful, it follows that an ideal news story would be one that a reader could easily comprehend and also could easily recall when the information in it needs to be retrieved.

Research Question and Justification for This Study

The goal of this research was to investigate a specific domain within the broad topic of schematic cognition and its bearing on the comprehension and recall of news. In particular, this study focused on the structure of print

news messages and the ways in which readers' schemas for such structure influence their interaction with the content of the messages.

Text Schemas and Text Structures: An Overview

Numerous studies indicate that a reader's familiarity with the way in which information is organized in a text has a significant impact on how well he/she comprehends and remembers it (Adams & Collins, 1977; Anderson, 1977; Marshall & Glock, 1978-79; Taylor, 1980; Pearson & Camperell, 1985; McGee, 1982; Whaley, 1981a, 1981b; Gourley, 1984; Rumelhart, 1985; Bobrow, Black, & Turner, 1985; Ruddell & Speaker, 1985). Research also demonstrates that different types of text have underlying "grammars" or linguistic structures that depend on the goal of the text--narrative structures have been identified for simple fiction stories (Rumelhart, 1975; Mandler & Johnson, 1977; Stein & Glenn, 1979), and a variety of structures have been found for various types of nonfiction text (chronological, taxonomical, persuasive, directive, expository, etc.; see Gillet & Temple, 1986, pp. 247-254). Van Dijk (1983, 1988a) has identified an underlying structure for hard news stories.

Story grammars are usually the first text structures acquired by readers, through early exposure to stories in childhood (Applebee, 1978; Hoover, 1981). Nonfiction

structures are learned later, generally from the third grade on (Gillet & Temple, 1986, p. 49). Richards (1978) has observed that many students who are reading fluently in the beginning grades start to experience reading problems in the fourth and fifth grades, when a greater amount of nonfiction material is introduced into the curriculum. She speculates that this phenomenon arises from children's lack of familiarity with text structures other that of the fictional narrative.

Green (1979) claims that the unfamiliar and often illogical organization of the typical hard news story can actually impede comprehension of the information contained in it. However, she provides no experimental data to support this hypothesis. How, in fact, does the traditional "inverted pyramid" structure of a news story influence comprehension and recall of news? And how might such effects be related to the receiver's prior knowledge of text structures? These questions are considered herein.

Goal of This Research

This study investigates some factors influencing the information gained from news stories, focusing principally upon the ways the structural organization of hard news stories affects their comprehension and recall.

Numerous studies have explored the comprehension and recall of news stories. Most of the research to date has

measured audience members' memory for the factual content of news stories (Edwardson, Kent, & McConnell, 1985; Katz, Adoni, & Parness, 1977; Gunter, 1981); little attention, however, has been paid to the cognitive processes involved in the assimilation, storage, and later retrieval of news content, or to the relationship between these processes and the news message itself. Recent research indicates that comprehension and recall are interactive operations in which a reader brings his/her prior knowledge and beliefs into play while encoding new information and later activates that knowledge for retrieval of the information (e.g. Bobrow & Norman, 1975; Schank & Abelson, 1977; Pearson, Hansen, & Gordon, 1979; Graesser & Nakamura, 1982; Freebody & Anderson, 1983; Stahl & Jacobson, 1986). The theoretical position on which these findings are predicated is known as schema theory.[1]

The Concept of Schema

The psychological concept of the schema emerged initially as a reaction to the traditional associationist models of memory and learning (e.g. Ebbinghaus, 1964), in which recall occurred simply as a response to a stimulus. The associationist model gradually gave way to the trace theory of mental representation, which evolved into schema

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[1]In this document, the word "schema" will be pluralized as "schemas" rather than as "schemata," as per the style used by Mandler (1984, p.2, note 1)

theory as we know it today (for a more complete account of the history of schema theory, see Hastie, 1981). The notion of a schema was first used in studies of memory and remembering and was later applied in the study of reasoning, learning, language processing, problem solving, reading, and countless other cognitive and psychosocial processes.

Definition of Schema

In general terms, a schema may be defined as a dynamic, generic mental framework for the hierarchical representation of knowledge. Anderson (1977) asserts, "A schema represents generic knowledge; that is, it represents what is believed to be generally true of a class of things, events, or situations" (p. 2). Each schema contains slots for its various components: for example, a rudimentary schema for a human face would contain slots for eyes, a nose, a mouth, and ears. Each new face encountered by an individual with this schema would present new information that could easily be fitted into these slots. Schemas are generally created, or instantiated, through experience; once in place, they are key to innumerable cognitive processes.

Graesser and Nakamura (1982), in an extensive exposition on the role of schemas in comprehension and memory, define schemas as "generic knowledge structures that guide the comprehender's interpretations, inferences, expectations, and attention. A schema is generic in that it

is a summary of the components, attributes, and relationships that typically occur in specific exemplars" (pp. 60-61).

Fiske and Taylor (1984) refer to a schema as "a cognitive structure that represents organized knowledge about a given concept or type of stimulus" (p. 140). In their view, a stored schema represents preexisting knowledge about a given topic and also guides the assimilation, interpretation, and subsequent recall of incoming information. They note that "cognitive research on the role of generic prior knowledge has demonstrated the importance of schemata in basic processes of understanding and memory" (p. 145).

Functioning of Schemas

An essential aspect of the concept of schema concerns the notion that schemas are active rather than immutable or static; schemas perform a variety of different operations and are constantly modified, altered, and elaborated as cognitive processes occur. Piaget (1952) writes of the processes of assimilation and accommodation of schemas that transpire whenever schemas are used in interpreting information. New information is assimilated via an existing schema; an individual with a more elaborate schema for the incoming information will be in a better position to absorb more details of the incoming data. Simultaneously, the

schema becomes enriched by accommodating or assimilating the new information. These phenomena occur constantly as information is continually processed, encoded and modified. Rumelhart (1980) posits that schematic learning involves three processes: the learning of facts, or accretion, in which information is encoded into schemas; elaboration and refinement of schemas through continued experience, or tuning; and the creation of new schemas, known as restructuring. Rumelhart's model illustrates the flexible nature of schemas.

Another key characteristic of schemas is their hierarchical organization. Rumelhart and Ortony (1977) note that

> each schema is characterized in terms of lower level constituents, or subschemata. Presumably, the dependence that schemata have on lower level schemata must ultimately stop, that is to say, some schemata must be atomic in the sense that they are not characterized by reference to any other constituent schemata. . . . Thus, our entire knowledge system would appear to ultimately rest on a set of atomic schemata. (p. 106)

Rumelhart (1980) describes schemas as "the fundamental elements upon which all information processing depends" (p. 33). Schemas can be used to interpret information, to retrieve information from memory, to organize actions, to set goals, to allocate resources, and to organize all information processing, but above all they are useful in the process of constructing meaning, or comprehending.

Rumelhart defines a schema as "a data structure for representing the generic concepts stored in memory" (p. 34).

Rumelhart and Ortony (1977) have identified four essential properties of schemas, to wit (a) schemas possess variables, (b) schemas can embed in one another, (c) schemas represent generic concepts of varying levels of abstraction, and (d) schemas are representations of knowledge, not definitions. To these four characteristics, Rumelhart (1980) added two more--(e) schemas are active processes, and (f) schemas are recognition devices whose processing is aimed at the evaluation of their goodness of fit to the data being processed.

Hastie (1981) recognizes three distinct types of schemas. The simplest are the central tendency schemas, also termed prototype schemas. Such a schema refers to "a member of a stimulus set that is located at the statistical center of the distribution of items in the set" (Hastie, 1981, p. 40), or to "the member of a category with the most attributes in common with other members of the category and the fewest attributes in common with members of other contrasting categories" (Hastie, 1981, p. 40). In other words, such a schema would represent the archetype of a given concept.

The second type of cognitive schema Hastie identifies is termed a template schema. These schemas classify, store, and coordinate incoming information. They are more active

in nature than prototype schemas in that they can add generic information to the schematic structure when anticipated information is not supplied during assimilation, they can modify schema boundaries depending on the nature of the incoming information, and they can perform tests on new information to determine its proper classification.

The most complex type of schema is labeled a procedural schema. Such a schema directs the exploration and information-seeking that make new information more readily available to the individual. It specifies the criteria by which new information is encoded into particular schemas or subschemas. It is elaborated and enriched when new information is assimilated. This type of schema "is a pattern of action as well as a pattern for action" (Neisser, 1976, p. 54).

Schema-Theoretic Information Processing and Its Application to the Mass Communication Model

In the schematic view of cognition, incoming information is encoded and stored via an appropriate schema or pre-existing mental knowledge structure. Graesser and Nakamura (1982) recognize two stages in the functioning of schemas during learning: schema identification and schema application. During schema identification, the learner selects a schema which matches some aspects of the input data. Here, the incoming information "matches the

components, attributes, and relationships of a particular schema better than alternative schemas" (Graesser & Nakamura, 1982, p. 62). Once an appropriate schema has been identified, schema application, the second stage, ensues. In this stage of information processing, the schema directs the perception and interpretation of new information and provides the prior information necessary to comprehend the new information. The schema also determines the amount of attention the learner gives to the elements in the incoming data and aids the learner in formulating expectations about relevant events or information that may follow. As Graesser and Nakamura point out, "[S]chemas are very powerful and intelligent knowledge structures" (p. 63). During recall, information is retrieved via the schema through which it was encoded.

Variations on this model of information processing have been developed (cf. Norman & Bobrow, 1976; Rumelhart, 1980), but the fundamental mechanism remains essentially the same in all of them. Schemas play a crucial and multifold role in the processes of comprehension and memory. Schemas generate a wealth of prior knowledge essential for understanding, they organize and format incoming information, and they provide an efficient mechanism for the retrieval of stored information.

These operations are all necessary in the comprehension and recall of news and other messages generated via the mass

media. In Lasswell's model of the communication process, the transmission of information via mass media is expressed in the question, "Who says what to whom through what channels of communication?" (Smith, Lasswell, & Casey, 1946, p. 121). Another widely accepted model of communication, the Shannon-Weaver model, also incorporates the sender-message-medium-receiver chain (Shannon, 1949). The processing of media-generated messages once they have reached their destination--i.e., the individual receiver (newspaper or magazine reader, broadcast listener or viewer)--is crucial to the success of any mass communication. Woodall, Davis, and Sahin (1983) point out that

> the process of understanding the news is a cumulative process both for the individual and for society. The ability or inability to understand and remember the news presented to viewers on any given day will leave viewers more prepared or less prepared to understand the news tomorrow. As a society, we make decisions about collective actions based on our understanding of the world around us which we derive in part from news stories. . . . If there is widespread and increased misunderstanding of certain news stories, we may all make poorer decisions. (p. 194)

The receiver in the mass communication model has been studied extensively from a variety of perspectives: A substantial body of research addresses the individual's use of the mass media and the gratifications derived therefrom (e.g. Blumler, 1979; Windahl, 1981) and the effects of mass media messages on the individual's behavior (e.g. Becker & Whitney, 1980; McLeod & Reeves, 1981; Weaver, 1982; Hawkins

& Pingree, 1983; Bryant & Zillman, 1986). Scant attention has been paid, however, to the cognitive processing of the mass media news message and the ways in which it is mentally stored and later retrieved (or not) by the receiver. Research of this type is still relatively in its infancy in the annals of mass communication scholarship.

Much of the existing research on the processing of mass media news messages focuses on memory for news, although a few studies do address the issue of comprehension of news stories. Very little empirical evidence is available to support existing hypotheses on these topics, and that which exists focuses primarily on the quantification of news recall (Booth, 1970; Neuman, 1976; Gunter, 1980, 1981; Findahl & Hoijer, 1975, 1981, 1985; Edwardson, Grooms & Pringle, 1976; Edwardson, Grooms, & Proudlove, 1981; Edwardson, Kent, & McConnell, 1985). Studies of recall and comprehension of news grounded in theory of cognition are virtually nonexistent.

The Swedish research team of Olle Findahl and Birgitta Hoijer has long been interested in the study of recall and comprehension of news messages. Several of their studies have shown that prior knowledge is vital to comprehension and recall of news (cf. Findahl & Hoijer, 1981; Findahl & Hoijer, 1985). In other words, the existence of a schema for a news topic or for some other aspect of a news story

will improve comprehension and recall of the story. As they point out:

> Schema theory stresses the organization of earlier knowledge in memory in general or prototypical schemata, representing standard situations, events, or structures. Two different kinds of schemata have been proposed: one deals with knowledge about recurrent events and situations . . . ; the other deals with knowledge about the typical structure of stories. . . . In news comprehension both kinds of schemata (about recurrent events and about the structure of news items) are probably activated. (Findahl & Hoijer, 1985, p. 390)

In a departure from the strictly numbers-oriented tradition of this line of research in mass communication, Woodall, Davis, and Sahin (1983) proposed a theoretical framework for memory and understanding of news based on principles of episodic memory and on the trace theory of memory and understanding. Another pioneer in this domain, Doris Graber (1988), conducted in-depth interviews with 21 subjects in Evanston, Illinois, to study their schema-based strategies for processing information gained mainly from the news media. These theoretical perspectives are strongly tied to the schematic model of information processing, the origins and ramificatications of which are discussed in the next chapter.

CHAPTER 2
REVIEW OF LITERATURE

Schema-based models of information processing have led to increased understanding of the recall and comprehension of written text. Central to the development of such models is the evolution of the construct of the schema as a paradigm for cognition.

In this chapter, the development of the schema theory of cognition is traced from its early applications in studies of memory processes to its current role in research on reading comprehension and recall of text information.

The Foundations of Schema Theory

Two seminal pieces of research form the keystones of schema theory as it is applied in the study of reading cognition today. The first is the work done by Frederic Bartlett of Cambridge University, England, as set forth in his book Remembering (1932). The second is a paper in the realm of artifical intelligence written by Marvin Minsky (1974).

Bartlett's Experiments On Remembering

Near the beginning of this century, Bartlett conducted a series of experiments with a view to studying systematically the specific social factors that influence visual perception, imaging, and memory, arguing that perception and imagery are both significantly affected by recalled prior information, and that they in turn influence memory.

To study perception, Bartlett exposed experimental subjects to shapes and patterns of varying complexity, and to pictures representing easily-identifiable objects and situations, for intervals ranging from 1/15 to 1/4 of a second. Subjects were asked to reproduce the illustration they had seen or simply to describe it. Bartlett observed that the subjects' perceptions of the stimuli were determined by their attitudes, interests, and dispositions. He observed that "in perceiving, the data presented have to be connected with something else before they can be assimilated" (Bartlett, 1932, p. 46).

Imaging was studied by means of a similar experiment in which Bartlett showed subjects various inkblots and encouraged them to describe them. The results of this experiment indicated that, again, subjects drew on prior information and attitudes when describing the inkblots, and that their reactions to the inkblots were part of a search for meaning in the stimuli. Bartlett noted that

> the subject, confronted by his task . . . and having to use the same instruments of subjective tendencies, bias, interests, and temperamental factors, casts about for analogies with which to subdue the intractability of the perceptual data. (1932, p. 45)

Bartlett's work on remembering is extensive, incorporating a series of experiments in which five different methodologies were used: the method of description, the method of repeated reproduction, the method of picture writing, and two methods of serial reproduction.

In the first experiment, Bartlett showed subjects a series of five picture postcards, each of which bore the face of a different naval or military officer. Subjects were briefly exposed to each postcard separately and thirty minutes after the exposure were instructed to describe the various cards in the order in which they thought them to have been presented. Recall was tested several times thereafter, following intervals of one week and longer, and questions on the stimuli were posed.

In the second experiment, Bartlett asked subjects to read the short story "The War of the Ghosts" by Franz Boas. Each subject read the story twice, silently, and after a lapse of 20 hours orally retold the tale. Bartlett studied the accuracy of the retellings and the various types of deviations from the original story stimulus.

The third experiment utilized the method of picture writing, where subjects memorized various symbols that represented words and were then asked to use the symbols in

writing down a dictated account of a short story containing words for which symbols had been taught. Bartlett studied methods of learning and conventions of representation, concluding that a few broad patterns of recall and transmission of symbols exist that are largely social in origin and character. He also found a negative correlation between determination to remember and actual forgetting.

Bartlett's final experiments were based on two methods of serial reproduction and were designed to study the effects of the transformations brought about by many individuals in the transmission of a stimulus. The experimental method used in the first of these experiments was similar to the method of repeated reproduction. Again, a subject was asked to read and retell a story, but the retelling was then reproduced by a second subject, whose retelling was in turn reproduced by a third subject, and so on. Bartlett's focus was the main trends of change in series of reproductions gleaned from a number of different subjects. A variety of stimuli were used, including folk tales and nonfictional passages. The experiment was conducted using a variety of different social and ethnic groups of subjects.

The second experiment using the method of serial reproduction was based on pictorial material--decorative patterns, illustrations, art forms, and other items. These picture representations were submitted to a course of

repeated and serial reproductions in the same manner as were the stories in the first experiment.

In both experiments, Bartlett found that transformations occurred which resulted in an overall loss of the individualizing features of each stimulus, so that in the final reproduction the stimulus had been changed into some more "conventional" representation of the original.

The theory of remembering that evolved from Bartlett's experiments laid the foundation for much of the schema theory on which this research is based. Bartlett (1932) noted that

> when any specific event occurs some trace, or some group of traces, is made and stored up in the organism or in the mind. Later, an immediate stimulus re-excites the trace, or group of traces, and, provided a further assumption is made to the effect that the trace somehow carries with it a temporal sign, the re-excitement appears to be equivalent to recall. (p. 197)

Bartlett postulated that these memory traces are linked in organized frameworks that support the process of learning and remembering. Each of these frameworks, or "postural models", he termed a "schema." In Bartlett's words, "'Schema' refers to an active organisation of past reactions, or of past experiences, which must always be supposed to be operating in any well-adapted organic response" (p. 201). In his view, schemas both influence the acquisition of new information and are continually being elaborated by the addition of new information.

Minsky's Frameworks for the Representation of Knowledge

By synthesizing a number of classical and modern paradigms from psychology, artificial intelligence, and linguistics, Marvin Minsky of the Massachusetts Institute of Technology developed a theory of memory based on the existence of "frames" that are similar in function to Bartlett's schemas. As Minsky defines it, "A frame is a data-structure for representing a stereotyped situation" (Minsky, 1974, p. 211); it is also "a network of nodes and relations" (p. 211). In his model, a frame has top levels which represent unvarying knowledge about the situations in question, and lower levels containing terminals or slots that are filled by specific instances or data. Each terminal or slot can specify conditions for the incoming data. Collections of frames and sub-frames are linked into complex frame systems, and frames within each frame system share terminals, which makes it possible to coordinate information gathered from different viewpoints. In the learning or data-acquisition process, information is matched with a frame and then assimilated. If no frame exactly matches the new information, the best available one is modified and stored, in much the same way that Bartlett's schemas are elaborated when new information is acquired. Memory, according to Minsky's hypothesis, is a function of frame retrieval--a process corresponding to schema activation during remembering.

The work of Bartlett and Minsky has had significant impact on the study of cognition and forms the underpinning of much of the recent research in reading cognition.

Schema-Theoretic Approaches to Reading Comprehension

As Durkin (1984) has pointed out, reading instruction has long taken into account a reader's prior knowledge as a crucial factor in the comprehension of printed text. Schema theory is predicated upon the notion that this prior knowledge is organized into dynamic knowledge structures in the brain that are activated during the reading process, as well as during other types of cognitive processing. As Adams and Collins (1977) have observed:

> The goal of schema theory is to specify the interface between the reader and the text--to specify how the reader's knowledge interacts with and shapes the information on the page and to specify how that knowledge must be organized to support the interaction. (p. 5)

Anderson (1985) has pointed out that from a schema-based perspective, reading involves the analysis of text at many different levels simultaneously. In his definition, processes that stem from the actual print on the page are termed "bottom-up" or "data-driven," while processes that originate with the reader's prior information about the text content are "top-down" or "hypothesis-driven" (p. 376).

Adams and Collins (1977) provide a model of reading comprehension that describes the act of comprehension as one

in which "top-down" and "bottom-up" schematic processing occur simultaneously. Using Aesop's fable "Stone Soup," the authors analyze the reading process on four levels: letter and word, syntactic, semantic, and interpretative. Letter and word recognition are fundamentally bottom-up processes, although words are recognized by letter and holistically--letter schemas activate word schemas, and, as a word schema becomes active, "it proportionally and reciprocally facilitates the letter schemata corresponding to its component letters" (p. 21). Syntactic, semantic, and interpretative processing are "top-down" operations, wherein prior knowledge or existing schemas about fables, word meanings, and problem-solving are brought into play so that the new information in the stimulus story can be efficiently encoded and understood. Schema theory has been applied to explain the comprehension of written text in numerous studies in the last decade (e.g. Anderson, 1977; Pace, 1978; Adams & Bruce, 1980; Pearson, Hansen, & Gordon, 1979; Anderson, 1985; Pearson & Camperell, 1985; Stahl & Jacobson, 1986). This recent research stems from the work of Bartlett.

Schank and Abelson (1977) defined a schema as "the large repertoire of knowledge structures brought to the reading task by the reader which enable him to understand information which is not directly contained in the text of a given action" (pp. 9-10). In other words, a schema-

theoretic approach to reading would suggest that reading is a process requiring a significant amount of prior knowledge on the part of the reader. Anderson (1977) proposes that language comprehension involves rapidly sorting information into slots in a schema. Slots are "placeholders" in schemas into which elements of incoming information can be fitted. To comprehend written material, a reader is required to fit textual information into slots in his/her schema for that information.

The notion that a schema must have been instantiated for reading comprehension to occur may be applied at several levels of the reading process. Some schema for the content of the text passage must exist for comprehension to take place (e.g. Stahl & Jacobson, 1986; Pearson, Hansen, & Gordon, 1979). Adams and Collins (1977) suggest that readers use schemas both to decode written symbols and to extract meaning from written words. And a growing body of literature indicates that some knowledge of the discourse structure or "text grammar" of a passage, i.e. a "text schema," is essential for reading comprehension.

Text Structures and the Reading Process

In his book Remembering, Bartlett proposed that recall of written material depends on a reader's schema for the structure of a written passage (Bartlett, 1932). Such structures, also known as text grammars, have been theorized

to be fundamental in the organization of all written text (Rumelhart, 1975; Rumelhart, 1977; Mandler & Johnson, 1977; Meyer, 1977a, 1977b; Stein & Glenn, 1979; Marshall & Glock, 1979; Taylor, 1980; Taylor & Samuels, 1983). Underlying structures have been isolated for narrative texts (story grammars), as well as for descriptive, expository, and argumentative texts. A rudimentary story grammar for a fable, for example, would comprise a story and a moral. Research indicates that a knowledge of text grammars is essential to the reading process; thus, a reader would have to have a schema for the "fable grammar" to recognize and assimilate a fable in its entirety.

Mandler and Johnson (1977) refer to a story schema as "an idealized representation of the parts of a typical story and the relationships among those parts" (p. 112).

The basic organizational pattern of the Mandler & Johnson (1977) story grammar comprises the following elements:

1. The <u>setting</u> of the story: The protagonist, and possibly other characters, are introduced; the temporal and physical locations of the story are indicated; any other information is provided which may assist the reader to follow subsequent events.
2. An <u>event</u>: An action or idea that precipitates further story developments.

3. An internal reaction, which may be either simple or complex: When the character's internal reaction leads to a single action, it is termed a simple reaction; when the internal reaction results in the setting of a goal, which is followed by an attempt to reach that goal, the internal reaction is a complex reaction.
4. An outcome: This is the result of the protagonist's attempt to arrive at the goal set in the internal reaction. If the outcome is not successful, the protagonist may try again, with a different outcome. The pattern may thus be repeated within a story.
5. An ending: A state of affairs in which the story is wrapped up "with a dramatic flourish" (p. 124).

Numerous studies have demonstrated that a knowledge of story grammars, i.e. the presence of story schemas in readers, facilitates reading comprehension and recall of stories. Mandler (1978) investigated the effects of scrambling two-episode stories generated on the basis of the Mandler and Johnson (1977) story grammar when testing for recall using second- , fourth- , and sixth-grade children as subjects, as well as a group of adult subjects. She found that the structure of the stimulus stories had a significant impact on the quantity, quality, and temporal sequencing of

recall for children and adults; when the basic story grammar was violated, subjects showed a tendency to recall stories according to the correct grammatical structure rather than in the form in which they were presented. It also appeared that children relied more on story schemas than did adults.

In a similar study using only adult subjects (n=64), Stein and Nezworski (1978) examined recall of stories of four types: (a) Exact Order (stories that followed the Stein & Glenn story grammar), (b) Slightly Disordered (two elements of the grammatical story transposed), (c) Randomly Ordered (story elements presented in random order), and (d) Unrelated Statements (twelve statements from which no causal order could be inferred). Subjects in the Exact Order treatment demonstrated nearly perfect recall of the stimulus material; recall dropped in each experimental condition as more story conventions were violated. Additionally, subjects who were instructed to recall the stories "in the form of a good, coherent story" rather than in the presentation format tended to recall the text in an order which corresponded almost exactly to story grammar order. The data indicated that the underlying structure of a story had a significant influence on its retention and recall.

In a more recent experiment, twenty fourth-grade children considered average or below-average readers, and who lacked a sense of story structure, were randomly assigned to one of two treatment groups: instruction in

narrative structure or instruction in dictionary usage and vocabulary (Fitzgerald & Spiegel, 1983). It was found that the children provided with instruction in story structure showed significant gains in reading comprehension compared with the control group. Spiegel and Fitzgerald (1986) provide details of the instruction given to the treatment group.

Fitzgerald (1984) found that in fourth- and sixth-grade children, there was a significant positive correlation between reading achievement and ability to anticipate narrative structure. The correlation was consistent across grade level.

Van Dijk and Kintsch (1985) hypothesized that (a) in order to understand narratives, subjects must have a general knowledge of a conventional narrative structure, (b) a subject's construction of a story structure comprises a necessary component of story comprehension, and (c) the information stored in memory corresponds to the structure of a text. All three hypotheses were experimentally supported.

Similarly, it has been shown that knowledge of nonfictional text structures helps readers better recall and comprehend nonfictional text (Meyer, 1975; Meyer, 1977a, 1977b; Meyer, Brandt, & Bluth, 1980; Meyer & Freedle, 1979; Mulcahy & Samuels, 1987). The expository text structure is written with the purpose of describing or explaining something. Meyer (1977b) notes that recall of expository

prose is primarily a function of recognizing superordinate (or top-level) and subordinate (lower-level) structural propositions in the text:

> The top level information in the content structure is similar to what educators have identified as the main ideas of a passage and the interrelationships among those ideas. The top levels of the structure appear to carry the central message of a passage. In contrast, the low-level information in the content structure is not part of the central message of a passage although it often supports various aspects of the message; instead, the low levels of the structure appear to contain information peripheral to the central message of a passage. (Meyer, 1977b, pp. 330-331)

Meyer has identified several types of organizational structures and relationships characteristics of nonfictional texts. These include taxonomical, chronological, cause and effect, directive, comparison and contrast, and enumerative or attributional. These organizational schemas are acquired gradually through long-term exposure to different discourse types.

Bartlett (1978) found the enumerative or attributional structure to be the most common type of textbook organization. An outstanding feature of the attributional expository text structure is the theme paragraph, where each paragraph begins with a topic sentence synopsizing the paragraph's content, followed by elaborative sentences.

Taylor (1980) found that children who are "good" readers (scoring higher on standardized reading tests than other children in the same grade) use prose text structure to organize recall. Taylor and Samuels (1983) found that

superior recall for expository text could be attributed to the use of text structure as a retrieval aid. More recently, in an examination of the complementary roles of text schemas and content schemas in reading, Ohlhausen and Roller (1988) determined that both types of schema are used in reading and comprehending expository text.

Schemas for the Structure of News Stories

Research which integrates cognitive science, schematic views of reading, and the processing of news information is still in its infancy. News stories would appear to combine the characteristics of narrative and expository text and thus possess a structure uniquely their own. That news stories follow a set structural pattern is a notion which has been intuitively acknowledged as true for many years. In the textbook Writing for Mass Communication, Hutchison (1986) points out that all hard news stories[2] should have a formal structure, beginning with a lead:

> In a good lead, the important things come first. They provide the umbrella under which all details of the story will fit comfortably. . . . The details usually flow from the lead in order of descending importance into the succeeding paragraphs. A simple

[2]The inverted pyramid story structure is characteristic of that of hard news stories, i.e. stories that are factual accounts of events, usually with a time element. Soft news stories (news stories with a human interest focus, written in a lighter vein) or feature stories often do not follow the inverted pyramid structure. The present research is therefore confined to hard news stories. For a more detailed classification of news story types, see McCombs, Shaw, and Grey (1979), Handbook of Reporting Methods, p. 293.

> news story about a minor traffic accident or a minor house fire will look like an inverted pyramid. (p. 125)

One form of the inverted pyramid structure is that described by Fedler (1989), shown in Figure 2-1 and discussed in detail later in this section.

The structuring of hard news stories is in fact so entrenched in the newswriting process that Tuchman (1978) claims that most news stories consist of prestructured patterns of words into which reporters insert "factoids."

The traditional "inverted pyramid" structure of news stories corresponds to the concept of a schematic structure or text grammar. Van Dijk (1983, 1988a, 1988b) observed that a news story can be viewed in terms of schematically structured discourse. Using cognitive models, Van Dijk examined media discourse and its representation in memory, and his analysis of newspaper stories led him to postulate an underlying macrostructure for news stories

> The overall organization of news discourse reflects the importance of macrostructures. These will typically be expressed by titles or headlines, by initial or final summaries, or by leads. . . .The lead, often printed in bold type . . . will express, in a first few sentences (which are, by definition, "thematical sentences"), the full macrostructure of the news discourse. Following sentences will then progressively specify further details of the events, with the less important ones at the end (with the practical consequences that these can, if necessary, be cut by the editor). Unlike argumentatively structured discourse, such as the scholarly paper, where the important conclusion comes at the end, news in the daily press is organized by the principle of relevance or importance, along a dimension of decreasing prominence with respect to the macro-structure. (Van Dijk, 1983, p. 35)

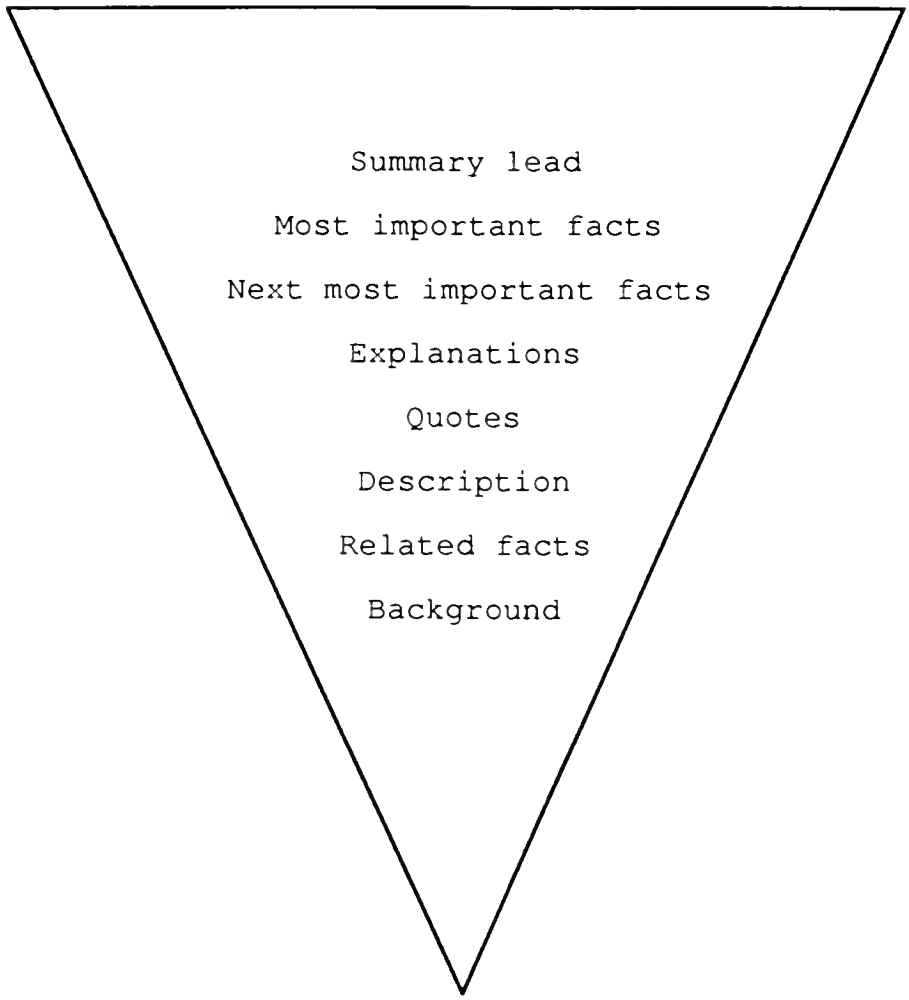

Figure 2-1. Fedler's inverted pyramid.

Van Dijk's grammar for news discourse is outlined below:

1. Summary/introduction
    - 1.1 Headlines
    - 1.2 Lead
2. Episode(s)
    - 2.1 Events
        - 2.1.1 Previous information
        - 2.1.2 Antecedents
        - 2.1.3 Actual events
        - 2.1.4 Explanation
            - 2.1.4.1 Context
            - 2.1.4.2 Background
    - 2.2 Consequences/reactions
        - 2.2.1 Events
        - 2.2.2 Speeches
3. Comments
    - 3.1 Expectations
    - 3.2 Evaluation

A diagrammatic representation of this structure is shown in Figure 2-1.

Van Dijk has noted that while the elements of this news macrostructure are present in almost all hard news stories, their sequence may vary depending on such factors as the semantic content of the story, the news values of the writer, the complexity of the story, and so on.

In his study, van Dijk analyzed news stories from a number of international newspapers; however, the macrostructure he proposed does not correspond very well with the average hard news story found in American

newspapers, especially with regard to the last category in the structure--the "Comments" category. In general, hard news stories produced in the United States do not include evaluations or predictions of possible consequences of the actual events detailed in the stories.

In a popular journalism textbook, Fedler (1989) describes the structure of a hard news story thus:

> The lead in an inverted pyramid story summarizes the topic, and each of the following paragraphs presents some additional information about it: names, descriptions, quotations, conflicting viewpoints, explanations, background data and so forth. Most paragraphs are self-contained units that require no further explanation, and only the summary of the entire story appears in the lead. News stories end with their least important details--rarely with any type of conclusion. (pp. 135-136)

Fedler's version of the inverted pyramid story may be graphically represented as shown earlier in this chapter in Figure 2-1.

Newsom and Wollert (1988, p. 120) determined that most news stories have the following elements:

1. The lead (the main point)
2. Secondary points in a tie-in transition
3. Elaboration on the main point
4. Support for the lead
5. Background
6. Development of the main idea
7. Details

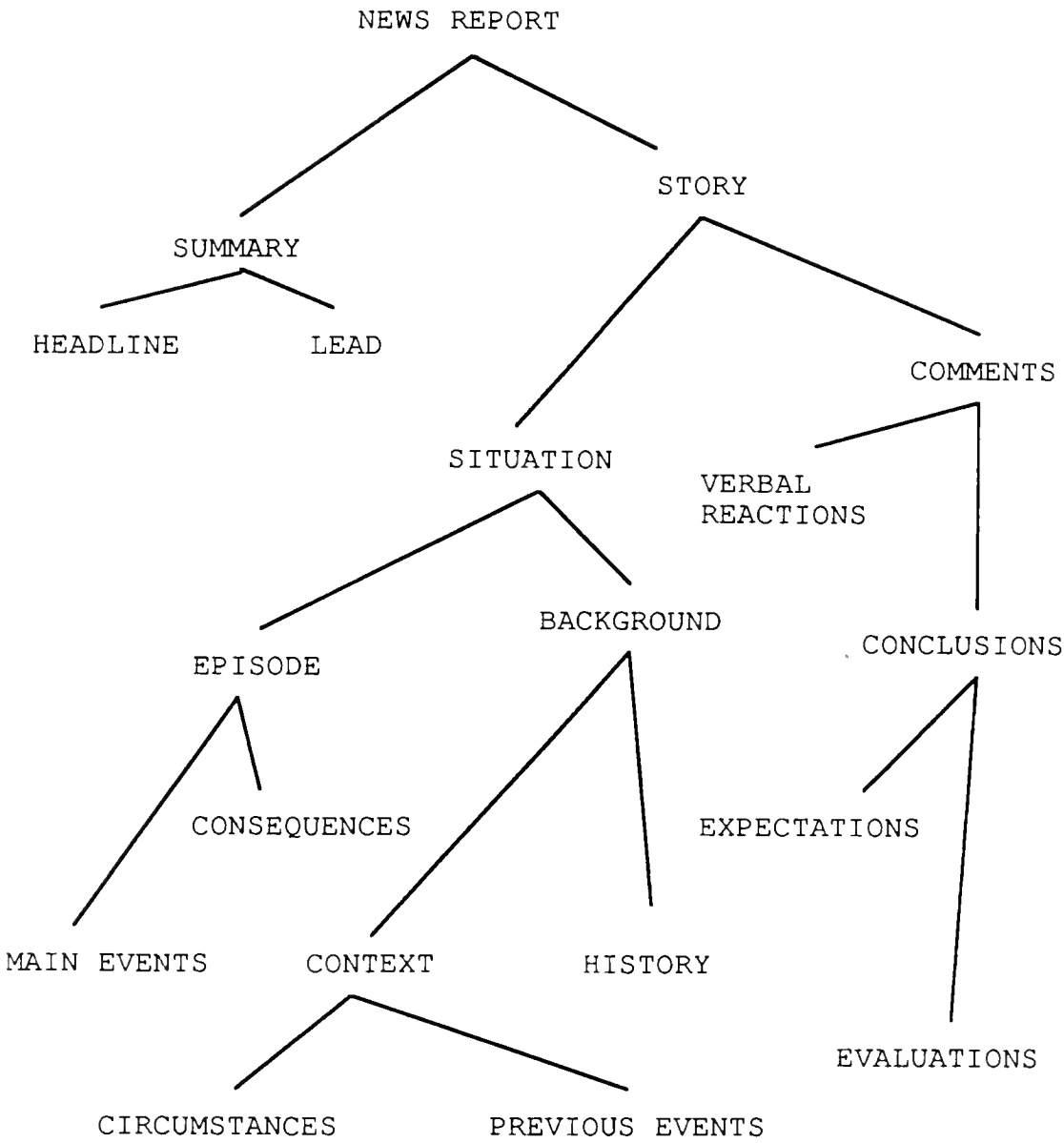

Figure 2-2. Diagrammatic representation of van Dijk's news macrostructure

They offer two diagrammatic representations of the inverted pyramid: the "traditional" inverted pyramid (Figure 2-3) and the "modified" pyramid (Figure 2-4).

For the purposes of this study, Newsom and Wollert's modified inverted pyramid structure will be adopted as the typical structure for a breaking hard news story in an American newspaper. Unlike the van Dijk structure, the Newsom and Wollert modified pyramid does not include any subjective elements such as comments on or analyses of the events contained in the story; the absence of these elements is far more typical of American news stories. Second, the Newsom and Wollert modified pyramid includes quotes and the possibility of a secondary theme in the story, which more complex news stories often contain; the traditional pyramid does not accommodate these elements. In this respect, the Newsom and Wollert pyramid is a more useful descriptor than the Fedler pyramid, which makes a provision for quotes but not for a secondary theme within a story.

Green (1979) suggested that a "typical" news story organization can, in fact, be detected, but that the organization hampers comprehension instead of facilitating it. The typical news story, in Green's view, is "disorganized and undirected, unconnected and jumbled up, with the result that it is difficult to follow" (p. 5).

LEAD: Who What When Where Why How 16 to 25 words

TIE-IN: One sentence connecting one element of the lead to the body

BODY: Development of the most important WWWWWH elements of the lead

Second most important element of WWWWWH

Further development of most important element

Other elements.

The least important facts of the story—nothing new introduced

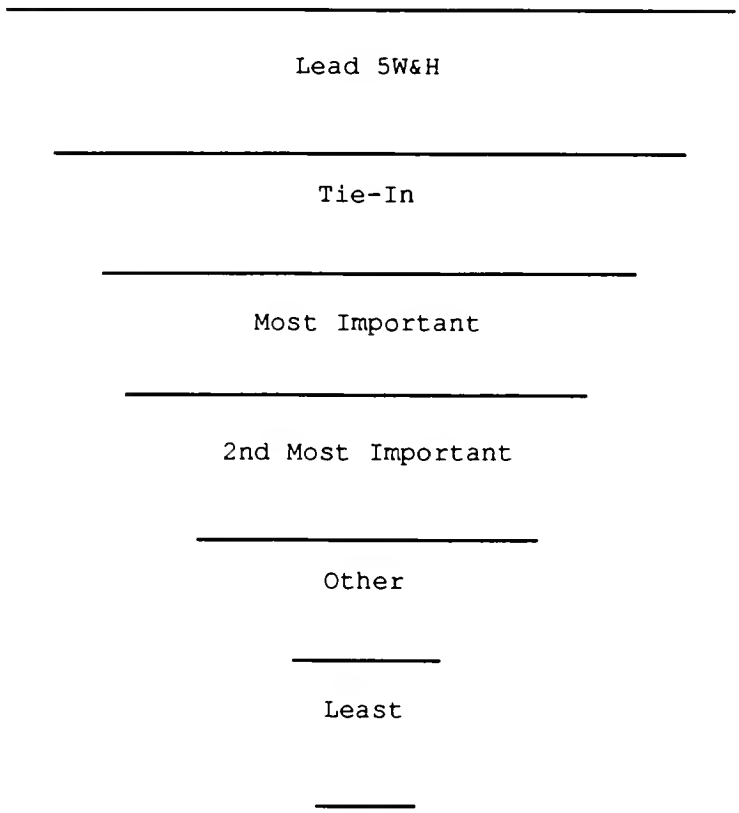

Figure 2-3. Newsom & Wollert's traditional inverted pyramid

LEAD: Major theme, could be significance of event, rather than fact
May be two sentences
May not include 5W&H

TIE-IN: The left-overs of the 5W&H not mentioned in the lead

1st Graph: Explication of the lead incident, quote, meaning, or background of event—how something came to be

2nd Graph: Additional information about most important fact of lead
Something to give credibility or significance to lead information

3rd Graph: Secondary theme or supporting documentation for the lead

4th Graph: Any other details, in order of significance to lead

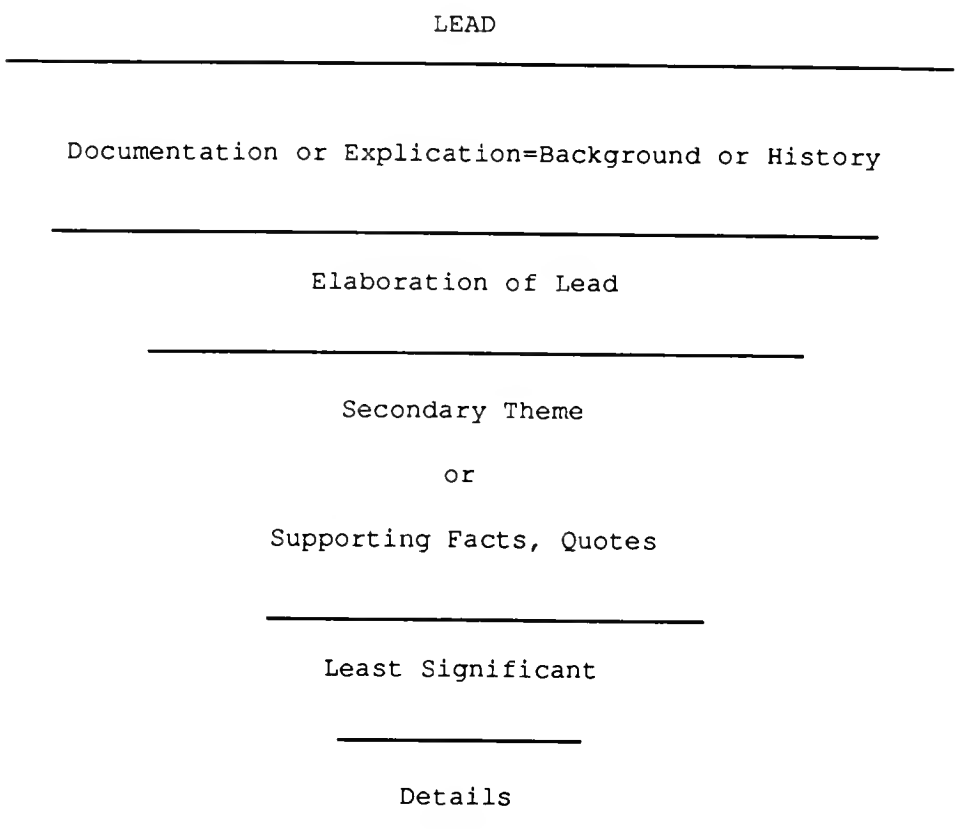

Figure 2-4. Newsom and Wolert's modified inverted pyramid

She recommends a complete overhaul of the guidelines reporters follow to shape their stories in favor of a structure that would ease comprehension.

Although the above analyses have revealed evidence of an underlying news story structure, Thorndyke (1977) found that altering the structure of a news story did not significantly influence readers' recall or comprehension of the content, the implication being that the structuring of a news story does not consistently affect the processing of information contained therein, contrary to the similar studies of this nature that have been conducted using narrative and expository text. Thorndyke, however, did not identify a standardized news or narrative structure in his experiment, and thus the scrambling of stories in his study was not systematic, which may render his results less than definitive.

Housel (1984) posited that the linguistic complexity of a news story influenced readers' recall and comprehension far more than did the structure of the story. He found that in the case of television news stories, linguistic complexity was indeed a better predictor of recall and comprehension than was story structure. However, the inverted pyramid structuring of a story in fact lends itself to a lower level of linguistic complexity than would be found in a narrative or expository story due to the absence

of cohesive devices, connectives, and transitions in inverted pyramid stories.

Nolan (1989) found that when a news story was rewritten to follow a chronological order, the gist of the story was better recalled by subjects who read it in the inverted pyramid form.

More research into this aspect of the nature of news stories and the processing of news content is needed at this juncture. Conventional perspectives and some empirical evidence support the concept of an underlying structural grammar for news stories. But to what extent does this structuring influence readers' interaction with printed news? Are stories which conform to the grammar more easily comprehended and recalled than stories which do not? Would familiarity with the structure of news stories increase readers' comprehension and recall of news? Concomitantly, if news stories were written to conform to structures with which readers were already very familiar--e.g. a narrative or expository structure--would recall and comprehension improve?

The implications of research of this nature would be multifold. Identification of a text structure which significantly influenced comprehension and recall of news might revolutionize the way newswriting is taught in journalism curricula. Several studies have been conducted to assess the influence of newspaper reading on reading

skills (cf. Stetson, 1977; Heitzman, 1979; Cheyney, 1984), but the schematic structures of news stories and their use by readers to facilitate comprehension and recall have not been incorporated into educational programs such as Newspapers in Education. Thus, instruction on news grammars in reading classrooms and literacy education programs--particularly those in which newspapers are used as teaching tools--could enhance readers' use of newspapers in the context of their daily lives as a direct result of increased comprehension and recall of news stories' content.

Limitations of the Schema Concept

Although cognitive models, particularly those utilizing the concept of schema, provide a comprehensive and useful framework within which to study information processing (Lachman, Lachman, & Butterfield, 1979), various critics of schema theory have pointed out its limitations as a research paradigm. The research conducted in this dissertation could not be fully and critically evaluated without some discussion of these limitations and their possible effects on the results of this study.

Schema theory is perhaps best characterized as a form of causal process theory, defined as "a set of descriptions of causal processes" (Reynolds, 1971, p. 11). This form of theory should incorporate (a) a set of definitions, including definitions of theoretical concepts, using nominal

and operational definitions; (b) a set of existence statements describing the situations in which the causal processes are expected to occur; and (c) a set of causal statements that describe the effect of one or more independent variables on one or more dependent variables (Reynolds, 1971, p. 97).

These three conditions have been met in the case of schema theory. (1) The term "schema" has been defined in a variety of ways, using both primitve and derived terms; some of these nominal definitions have been presented earlier in this work (see Chapter 1). (2) Schemas are thought to guide information processing in virtually any situation requiring cognitive activity. (3) Schema theory describes the way cognitive structures cause information to be assimilated, stored, and later retrieved. These cognitive structures are posited to affect such dependent variables as thinking, perception, comprehension, memory, information gain, and concept formation.

Fiske and Linville (1980) evaluate schema theory according to attributes of a good theory such as predictive capability, link to observables, and heuristic value. While schemas have good predictive power and tremendous heuristic provocativeness, as is exemplified by the numerous studies predicated on the schema concept, the link between schemas and observable entities remains tenuous. As Fiske and Linville observe, "There is no manipulation check for a

schema" (p. 547). This fact remains the most significant limitation of schema theory: because no method of measuring a schema is consensually accepted at present, "schema" is still considered an abstract and vague concept.

A second criticism hinges on the idea that the schema concept cannot be falsified because a schema can be used to explain virtually any experimental result, even results that contradict one another. In theory testing, as described by Popper (1963), the theory needs to be weighed in relation to empirical findings which constitute attempts to falsify the theory. Reynolds (1971) observes that a theory can best be refined by testing axioms or statements in the theory which are most likely to be false; when empirical findings refute a theoretical statement, the theory is modified and improved. However, the failure of empirical findings to refute the causal process statements implicit in schema theory should not constitute an automatic indictment of the theory. Rather, "[e]mbedded in a well-specified theory of process, the schema construct becomes more clear, consistent, powerful, and thus more falsifiable" (Fiske & Linville, 1980, p. 546).

According to Fiske and Linville (1980), some critics claim that schema theory explains phenomena already adequately explained by attitude and attribution theory--i.e., that an individual's schema for something is simply another word for his/her attitude toward it or a way of

describing attributions made about it. However, as these authors point out, the schema can be thought of as a metaconstruct which explains both attitude formation and attribution, thus providing a framework within which to study the internal processes guiding attitude change and behavior. Rather than reiterating old findings, schema theory actually presents new conceptualizations of previously-observed phenomena.

In short, it would appear that schema theory provides a distinctively new orientation to the study of cognitive processes. New research questions and strategies have been generated from the study of schematic information processing, and explanations for previously unexplained phenomena have been established. On the basis of these criteria, schema theory can be accepted as a paradigm to be used to understand and explain human cognition.

Predicted Associations

The theory and research findings summarized in this chapter point to a number of empirical relationships that were explored in some depth in this study. The schematic structure of text has been shown to significantly affect readers' recall and comprehension of the information contained therein; similarly, readers' familiarity with text structures--i.e., the strength of their text schemas--has been demonstrated to affect their comprehension and recall

of the text information. The extent to which these relationships hold true in the case of printed news messages was the focus of the present research.

Nominal Definitions

To clarify the method and hypotheses employed in this study, explicit definitions of the concepts under investigation should first be provided.

Schema

The concept of schema forms the crux of this study; while definitions and descriptions of this concept abound, as illustrated in Chapter I, above, these definitions differ only slightly; researchers seem generally to share an agreement regarding the notion that the term "schema" refers to a malleable cognitive structure representing generic knowledge. The definition of schema used by Graesser and Nakamura (1982) seems to express explicitly and concisely the nature and function of schemas and thus will be the definition adopted for this study. Thus, a schema will hereinafter be defined as a dynamic, generic knowledge structure that guides interpretation, inferences, expectations, and attention (see Graesser & Nakamura, 1982, pp. 60-61).

Text schemas and text structures

The specific type of schema known as a text schema bears particular relevance to this study, along with the related concept of a text structure or text grammar. The term "text structure" refers to the underlying organizational pattern of a given text; the representation of this pattern in the reader's mind is the text schema. Mandler and Johnson (1977) define a story schema as "an idealized internal representation of the parts of a typical story and the relationships among those parts" (p. 111). Stein and Glenn (1979) describe a story schema as "the underlying structure used to comprehend the informational units in a story and the relations that occur between the units" (p. 53). This notion of a cognitive model representing the structure of a story can be applied to other types of written text also. Therefore, hereinafter a text schema will be defined as an idealized mental representation of the informational units in a typical example of a particular type of text and the relationships among those units. Narrative, or story, schemas, expository text schemas, and news story schemas will be studied in this investigation.

Stein and Glenn (1978) noted, "Stories can be described in terms of a hierarchical network of categories and the logical relations that exist between these categories" (p. 58).

This underlying organizational structure of a text will be identified in this work as the text structure or the text grammar (the two terms will be used interchangeably).

Recall and comprehension

Recall and comprehension are the dependent variables of interest in this study. Both terms encompass a wide variety of cognitive phenomena. However, the two constructs are closely linked. Van Dijk (1987) observes that "one result of understanding a text is a representation of the meaning of the text in (episodic) memory" (p. 165), the direct implication being that text comprehension always results in the storage of information in long-term memory for later retrieval, i.e. text comprehension always precedes long-term recall of text information. Voss (1984) corroborates this notion. He writes

> While reading, the individual is assumed to interpret the text contents in terms of his or her own knowledge, interests, and attitude. During the interpretive process the individual develops a representation of the contents of the text. Learning is thus presumed to involve the storage of information via the development of the representation. (p. 197) (emphasis added)

Irwin (1986) describes comprehension as comprising several processes that proceed simultaneously: microprocesses, involving "[t]he initial chunking and selective recall of individual idea units within individual sentences" (p. 3) as well as integrative processing, in which the relationships between clauses and sentences are inferred; and macroprocesses, involving elaborative and

metacognitive processes. The ultimate result of these comprehension processes is a good representation of the text's ideas in memory.

Thus, separating comprehension from memory as two distinct constructs gives rise to some difficulties. Nevertheless, the inferential and elaborative aspects of the comprehension process do distinguish it from the phenomenon of storing literal information drawn from a text.

Recall. As Belli (1986) observes, rival psychological theories have resulted in very different interpretations of the memory process. The mechanistic model of memory, for example, views it as a passive process, whereas schema-based models regard memory as an active, adaptive operation. The latter position will be adopted for the purposes of this study.

Memory is generally measured as recall, a term which also possesses different meanings in different contexts. In the mass communication literature, recall is further classified into aided and unaided recall. Katz, Adoni, and Parness (1977) refer to unaided recall as "spontaneous recall" (p. 232). British psychologist Martin Le Voi, on the other hand, terms it "free recall" (1986, p. 105) and describes the process as happening in a situation where "the subject is free to recall any items . . . and create and use helpful cues in any way he or she wishes" (p. 105). Generally, unaided or free recall means the unprompted

remembrance of information; aided recall, on the contrary, refers to the process of remembering information in a situation where prompts or cues are provided. Le Voi calls this latter phenomenon "cued recall" (p. 106). He notes that models of memory based on the encoding specificity principle (ESP) make no distinction between cued recall and recognition.

To avoid any confusion, hereinafter unaided or free recall will simply be termed "recall" while aided or cued recall will be termed "recognition".

In this study, the research question was framed in terms of long-term benefits to the reader from the assimilation of information contained in printed news stories. Thus, recognition is not of as great interest as recall. In addition, long-term recall is of greater significance in this investigation than short-term recall. Nevertheless, both short-term and long-term recall were measured.

Comprehension. Irwin (1986) defines comprehension as

> the process of using one's own prior experiences (reader context) and the writer's cues (text context) to infer the author's intended meaning. (p. 9)

The assessment of text comprehension has traditionally been effected via the use of text-based questions (see Trabasso, van den Broek, & Liu, 1988). Comprehension in this experiment was assessed using a questionnaire that measured subjects' literal, inferential, and evaluative processing of

the stimulus texts. Literal comprehension refers to the retention of facts from a text; inferential comprehension requires the reader to use his or her prior knowledge in conjunction with information in the text to construct meaning from the text; and evaluative comprehension occurs when the reader is able to formulate some judgment about information contained in text.

Literal comprehension may be assessed using textually explicit questions, defined by Pearson and Johnson (1978) as questions having "obvious answers right there on the page" (p. 157). Inferential comprehension is measured through the use of textually implicit questions. "Comprehension is regarded as <u>textually implicit</u> if there is at least one step of logical or pragmatic inferring necessary to get from the question to the response <u>and</u> both question and response are derived from the text" (Pearson & Johnson, 1978, p. 161). Evaluative comprehension is assessed by means of scriptally implicit questions:

> Scriptal comprehension . . . occurs when a reader gives an answer that had to come from prior knowledge (it is not there in the text) to a question that is at least related to the text (that is, there would be no reason to ask the question if the text were not there). It is similar to textually implicit comprehension in that an inference is involved; however, it is different in that the data base for the inference is in the reader's head, not on the page. (Pearson & Johnson, 1978, p. 162)

CHAPTER 3
METHOD

To explore the connection between the schematic organization of news stories and the receiver's cognitions regarding the news message, an experimental study of the relationships between these variables was undertaken. Green's (1979) hypothesis that the organization of news stories hinders comprehension and recall of the message was empirically tested; in addition, the significance of the existence of a reader's schema for news story structure was investigated under experimental conditions.

The most commonly encountered types of text organization are the narrative or story grammar and the expository text structure. The story grammar forms the basic framework of all simple stories (see Mandler & Johnson, 1977; Stein & Glenn, 1978). While many types of nonfiction text structures have been identified, Bartlett (1978) found that the expository structure, in which facts are organized in terms of main points and supporting details, is used most frequently in nonfiction text. Thus, in schema theoretic terms, it would appear that these two organizational patterns would be the most familiar to readers.

The simple story grammar and the expository text structure were thus selected as the text grammars with which to compare the inverted pyramid news story structure. Readers' schemas for these patterns were also measured to gauge the extent to which strength of text schema affected information processing from a printed news story.

Hypotheses

This study investigated the influence of text grammars, the underlying organizational structures of text passages, on readers' recall and comprehension of passage content. Generally, it was hypothesized that narrative and expository text grammars would be more conducive to high recall and comprehension than the news story grammar.

The following hypotheses were tested:

H1: A text passage organized according to a narrative story grammar will be better remembered in the short term than a passage organized according to an expository text grammar, which in turn will be better remembered in the short term than a passage organized according to a news story grammar.

H2: A text passage organized according to a narrative story grammar will be better remembered in the long term than a passage organized according to an expository text grammar, which in turn will be better remembered in the

long term than a passage organized according to a news story grammar.

H3: A text passage organized according to a narrative story grammar will be better comprehended than a passage organized according to an expository text grammar, which in turn will be better comprehended than a passage organized according to a news story grammar.

The following hypotheses were postulated to find a theoretical basis for explaining the results of the above investigations:

H4: Readers with highly developed schemas for a particular text structure will have higher recall of that type of text than readers with weak schemas for that structure.

H5: Readers with highly developed schemas for a particular text structure will have better comprehension of that type of text than readers with weak schemas for that structure.

Operational Definitions

The Independent Variables

Short-term and long-term recall of text and text comprehension were hypothesized to vary with the underlying structure of a text. Thus, the principal independent variable in this study was text structure, which was

manipulated to assess its effects on the cognitions under examination. Readers' text schemas were also hypothesized to affect their recall and comprehension of text in the various structural conditions.

Schematic structure of text

The variable manipulated to predict readers' recall of a news message was the schematic structure of a stimulus hard news story. This structure was systematically varied so as to measure fluctuations in recall that might result from changes in the news story structure.

In general, news writers in the United States follow Associated Press guidelines for the organization of news story material. Stimulus news stories were generated by selecting two front-page hard news AP stories from a national newspaper according to how well they typified a hard news story as it is defined by McCombs, Shaw and Grey (1979) (see Footnote 2 in the preceding chapter).

Stimulus news stories were rewritten twice: once to follow the Mandler & Johnson (1977) narrative grammar and again to follow the expository/attribution text structure outlined by Meyer (1975), both described in an earlier chapter. The purpose of the rewriting was to provide stimulus materials to test which, if any, structural pattern contributes most to increasing levels of comprehension and recall of the passage's content.

The news stories chosen as experimental stimuli were rewritten to follow the patterns for narrative and expository text as closely as possible without significantly altering the content, length or readability level of the passages (see Table 3-1). The content of the stories was such that they could not be rewritten to follow exactly the story or expository text grammars, but the narrative and expository versions produced for use in this experiment were reasonably close facsimiles of the ideal structures.

Text schemas

A second independent variable hypothesized to predict variations in readers' comprehension and recall of text was the strength of their schemas for the particular pattern of organization inherent in the text. This factor is not, strictly speaking, an independent variable in that it was not experimentally manipulated. However, since it was hypothesized to be a predictor of changes in recall and comprehension, it was analyzed as an independent variable in this study. It has been shown that recognition of text patterns increases recall and comprehension (Mandler, 1978; Fitzgerald & Spiegel, 1983). Wicks (1986) points out, "Schema theory suggests that individuals possessing a well defined schema in [a] domain will have more success at recall of related information . . . (p. 7)."

Table 3-1

Descriptive statistics on the stimulus passages used to measure recall and comprehension

Wicks notes that generally schemas have been measured either by means of survey questionnaires or through experimentation, adding:

> Most of the studies aimed at demonstrating the presence of a schema rely on measurement approaches that test recall, evaluate inferential capabilities and assess the tendency of an individual to cluster related concepts. (p. 4)

In this study, the method of measurement used by Bower, Black, and Turner (1979) and Kinney (1984) was adopted: The subjects' familiarity with different text structures was assessed by their responses to a task in which they were instructed to reconstruct scrambled passages to form well-ordered, typical news, narrative, or expository texts, depending on which type of scrambled passage they were given. The scrambling of the stimulus passages was systematic in that each text passage was broken down into its nodes according to the text structure on which it was based. Each subject was randomly assigned to one of three structure conditions (news, narrative, or expository).

Again, the passages used were similar in terms of length and readability level, although the content differed (see Table 3-2).

The Dependent Variables

The response variables hypothesized to change with the structural organization of the stimulus text and with readers' schemas for that structural organization were recall and comprehension of the content of the text. As indicated in the previous chapter, a substantial body of ex-

perimental research indicates that variations in text organization result in significant changes in recall of both fiction and nonfiction passages; these findings provided the basis for the present experiment, in which a news story was used as the primary stimulus for further investigations along these lines

Recall

Typically, memory for news is measured as either recall or recognition. Recognition measures include multiple-choice questionnaires and retelling tasks in which subjects are prompted to remember specific pieces of information. Recall is frequently measured more informally, usually by means of a request to "write down brief descriptions" of what is recalled (Gunter, 1980) or requests for verbal descriptions of the stimulus passages (Edwardson, Kent, & McConnell, 1985).

In the present experiment, recall of the stimulus passages was measured according to the procedure developed by Meyer (1975), adapted by Taylor (1980) and Taylor and Samuels (1983), and later used by McGee (1982) for scoring recall of expository text--a method similar to the scoring procedure followed by Mandler and Johnson (1977) for measuring recall of narrative text. After being given an interference task in which they provided the researcher with

Table 3-2

Descriptive statistics on the stimulus passages used to measure strength of text schema

demographic information and answered a test evaluating their reading level (the West Informal Reading Evaluation; West, 1978), subjects were asked to write down an account of the stimulus passage they had read, keeping as close to the original version as possible. The recalled texts were scored by comparing them to the originals on the basis of the proportion of elements of the initial passage recalled per structural node. The sequencing of the recalled propositions was not analyzed in this experiment, since sensitivity to text organization was assessed using the text schema instrument. A simple score based on the overall proportion of the stimulus passage recalled was judged to be sufficient. The overall proportion of terminal nodes recalled was computed as a percentage score.

Comprehension

Comprehension was measured on the basis of nine questions. Questioning is a standard method of gauging comprehension (see Anderson & Biddle, 1975; Johnson, 1983; Wilten, 1987; Trabasso, et al., 1988). The types of questions used were loosely based on Pearson and Johnson's description of textually explicit and scriptally implicit questions (Pearson & Johnson, 1978) as well as on the comprehension questions used in Johns' (1988) Basic Reading Inventory, a standardized informal reading evaluation instrument. Five of the nine questions were literal, eliciting information based on main points or details that

could be found directly in the text. Of the remaining four questions, two were evaluative, requiring the reader to assess a situation; one was inferential, calling on the reader's prior knowledge of the situation; and one was a global question asking for a summarization of the main point of the stimulus passage.

A tenth question was included which asked, "How well do you feel you understood the story?" This general self-evaluative measure was based on the concept of comprehension used by Housel (1984) and Thorndyke (1977).

Reliability and Validity of Measurement Instruments

As Selltiz, et al. (1976) point out, "The quality of research depends not only on the adequacy of the research design but also on the quality of the measurement procedures employed" (p. 160). Good measurement instruments must be dependable measures of the target concept--i.e., they must be as free as possible from random error caused by testing conditions or inconsistencies among scorers or observers. In addition, they must accurately identify and measure the concept in question. The two principal properties of an instrument that affect its usefulnesss as a measurement tool are its reliability and its validity.

Reliability

Reliability of a measurement instrument refers to the steadiness of scores on the instrument. Reliability may

be measured in terms of stability, or consistency of scores over time; internal consistency, sometimes called homogeneity--the similarity of items within a test or other instrument; and equivalence, or consistency across different forms of the same instrument. This third aspect of reliability becomes important only when different forms of an instrument are being used to measure the same construct.

The reliability of the instruments used in this study was assessed in terms of stability and equivalence.

Reliability of the instruments was measured using the alternate forms method. Twenty-four undergraduate students at the University of Florida were asked to participate in the reliability study. The students responded to the various measures in the experimental sequence described later in this chapter. Two days later, the experiment was repeated with the same class; however, while students remained within the same experimental condition (news, narrative, or expository), they were given different stimulus passages on the second day. Thus, they were effectively given alternative forms of a single test.

A coefficient of stability and equivalence was computed according to the formula

$$\rho_{AB} = \frac{(A-\bar{M}_A)(B-\bar{M}_B)}{SD_A\ SD_B}$$

where A represents a subject's score on the first test (Test A), B represents the subject's score on the second

test (Test B), $\bar{M}_A$ represents the mean score on Test A, $\bar{M}_B$ represents the mean score on Test B, SD_A represents the standard deviation of scores on Test A, and SD_B represents the standard deviation of scores on Test B. (For a more detailed explanation of the alternative forms method of reliability assessment, see Walsh & Betz, 1985, pp. 50-51, and Horvath, 1985, pp. 71-85).

Reliability coefficients for the instruments used in this experiment are given in Table 3-3. In some cases the reliability coefficients computed were slightly below 0.50.

Table 3-3

Reliability coefficients of measurement instruments

INSTRUMENT	RELIABILITY
Schema measure	
News	0.57
Narrative	1.00
Expository	0.44
Recall measure	0.44
Comprehension measure	0.46

These low coefficients could be attributed to small size of the sample used in the reliability tests; the instruments weregenerally considered acceptably reliable. Selltiz, et al. (1976) point out that low reliability coefficients are not necessarily indicators of low validity of measurement instruments (pp. 194-197). They argue that

in some cases, fluctuations in scores on measurement instruments from one test administration to another or even within a test are desirable in that tests that produce extremely homogenous results are not as useful for making fine discriminations among responses and may in fact reflect a high degree of constant error. They note that the assessment of reliability and validity occurs along a continuum from convergence of scores to divergence, depending on the correlations being computed, and that "if a measure can be shown to be reasonably valid . . . it must ipso facto be reasonably reliable, since a measure with a large error component could not show such consistent relationships" (p. 197).

Validity

"The validity of a measuring instrument may be defined as the extent to which differences in scores on it reflect true differences among individuals on the characteristics that we seek to measure" (Selltiz, Wrightsman, & Cook, 1976, p. 169). In other words, the validity of a measure refers to the extent to which it is a true gauge of the construct it is supposed to measure. Here, the crucial questions would be whether the recall instruments were accurate measures of subjects' memory for the stimulus passages and whether the comprehension instruments were accurate measures of subjects' understanding of the passages' content.

Face validity

As a very superficial test of an instrument's validity, the relevance of the instrument to the construct under investigation should be apparent "on the face of it" (Selltiz, et al., 1976, p. 178). Because the measurement instruments used were derived from the stimulus passages themselves and were constructed following the methods used by earlier investigators of similar phenomena, the instruments exhibited significant face validity.

Content validity

Content validity is an estimate of the extent to which the measurement instrument is an adequate sample of the domain or process being measured (Selltiz, et al., 1976, p. 179). Generally, content validity is assessed by submitting the measurement instrument to the scrutiny of experts, who verify that all facets of the construct or domain under investigation are represented in the instrument. The instruments used in this experiment possessed considerable content validity because they were derived exclusively from the stimulus passages read by the subjects, measuring recall of each structural proposition within each passage and comprehension of ideas contained within the passage. The measures thus represented an adequate sample of the processes under examination.

Construct validity

In this experiment, the dependent variables "recall" and "comprehension" are constructs or abstractions that describe traits possessed by the subjects--i.e., the ability to remember and to understand text. Construct validation refers to the process of estimating to what extent the measurement instruments measure these latent traits.

Construct validation may be accomplished by means of examining patterns of correlation of a measure with other validated measures of the same trait (convergent validity) and by showing that the trait as measured by the instrument in question can be differentiated from other traits or constructs (Selltiz, et al., 1979, p. 174).

Curtis and Jackson (1962) have suggested that high correlations between measures intended to measure different but theoretically related constructs provide evidence of convergent validity. In this study, comprehension and long-term recall were expected to vary together; they are theoretically related but conceptually distinct constructs. Their construct validity was estimated by measuring the degree of correlation between subjects' scores on the measure of comprehension and the measure of long-term recall based on the same stimulus passage. The Pearson correlation coefficient was found to be 0.33 (N=69); this correlation was statistically significant, $p = .003$. Short-term recall was measured by means of the same instrument used to assess

long-term recall; thus, convergent validity was established for the comprehension and recall measures.

The instruments used to assess recall of the passages were thus generally judged to be reliable and valid.

The Control of Possibly Confounding Variables

The dependent variables, recall and comprehension of the informational content of text, are influenced by numerous factors. To date, most of the research on this process has been conducted using children or adults with reading problems as subjects; knowledge remains scarce regarding influences on the reading recall and comprehension of normal adult readers.

Age has been determined to be a major factor affecting the reading ability of children (Chall, 1983). Developmental stages of reading ability have been found among adults with reading difficulties (Norman & Malicky, 1987), but these are not associated with age. Thus, while subjects' ages were noted during data collection for this experiment, they were not taken into account when the data were analyzed.

Factors influencing the reading and learning abilities of adults with impaired reading facility include cultural background, physiological influences, and educational level (Newman, 1980). Bowen and Zintz (1977) list sociological, physical, environmental, and psychological factors as

significant influences on the reading abilities of adults in literacy programs; they also include learning ability or IQ as an important determinant of reading skill.

In this experiment, the final subject group chosen consisted of undergraduate students at the University of Florida. Their ages ranged from an 18-to-24-year-old group to a 50-to-64-year-old group. The modal age range was 18 to 24 years, with 87.5 percent of the subjects falling into this group. Most of the subjects used in the experiment happened to be women (89 out of 104 subjects were female). Ninety-four of the subjects were white, six were black, two were Asian, one was Hispanic, and one did not indicate a racial designation. In a general sense, the group could be seen as homogenous: little variation in age, SES, educational background, race, or cultural background was evident. The selection of subjects alone resulted in the effective control of sociological, environmental, and educational variables which may have interfered with the experimental manipulation.

Norman, Malicky, and Fagan (1988) have pointed out that the reading level of the adult reader could affect text comprehension and recall. Although it could fairly safely be assumed that because the subjects were all college undergraduates at the same institution, their reading levels were on a par, reading level was nonetheless measured using the West Informal Reading Evaluation (West, 1978). Data

collected from the eight students reading below the college level, as estimated by the WIRE, were not included in the data analysis. Reading level was thus eliminated as a confounding variable.

Schema theoretic views of reading suggest that prior knowledge of text content strongly influences reading comprehension and recall (Pearson, Hansen, & Gordon, 1979; Stahl & Jacobson, 1986; Perin, 1988). Thus, two text passages were used in the experiment as a verification tactic, to determine whether the observed effects occurred regardless of text content. Passage I was drawn from a wire story published in The Independent Florida Alligator. The original article referred to incidents in Beijing, China, in May 1989, but the setting was changed to Paramaraibo, capital of the South American country of Surinam. All names in the passage were changed. Passage II was a brief wire article about a captive-breeding program to protect the endangered Florida panther.

Within each text passage condition, the different structural versions were kept as similar as possible in terms of their length, average sentence length, and readability (calculated according to the Fry formula conceived by Edward Fry, 1977), so that any influences on recall and comprehension arising from these factors might be minimized. Only the passages' structures were varied.

Descriptive statistics pertaining to these characteristics of the stimulus passages are provided in Table 3-1.

The content of the two passages precluded rewriting to exactly follow the narrative or expository text grammars, but these were approximated as well as possible. The narrative version of the political uprising story fell short of representing a true story in that it lacked a single protagonist--the political demonstrators filled that role en masse. In the panther story, a goal was implied in the setting in that the protagonist's desire to combat a problem was tacitly expressed in the first sentence. However, generally speaking, the passages adhered to the Mandler and Johnson (1977) story grammar in their narrative forms and to the Meyer (1975) expository/attribution grammar in their expository forms.

The Experimental Design

The overall experimental design comprised a single-factor posttest-only procedure. The manipulated variable was text structure; the response variables were short-term recall, long-term recall, and comprehension. The strength of subjects' text schemas for each of the structures used was also measured as a quasi-independent variable. The experiment consisted of six tasks.

Subjects

The power of an experiment is the probability of rejecting the null hypothesis if the null is false. This probability is increased by minimizing the chances of making a Type II error by finding support for a false null hypothesis. The power of an experiment is determined by the size of the sample of the subject population (see Winer, p. 104). Fifteen subjects per cell were computed to be required to minimize Type II error at a 0.05 level of significance. Because there were six cells in the design, 90 subjects were needed for this experiment.

Subjects were undergraduate students at the University of Florida, drawn from senior-level classes in journalism, education, and speech communication. However, not all subjects were majoring in these disciplines. After the elimination of the poor readers, one hundred and four students participated in this study. All students were juniors or seniors. Subjects' ages ranged from 18 to 64.

Table 3-4

Summary table of descriptive statistics on sample subjects

N=104

SEX:	Male	15
	Female	89
RACE:	White	94
	Black	6
	Asian	2
	Hispanic	1
	Other	1
AGE:	18-24	91
	25-34	6
	35-49	6
	50-64	1

EDUCATION:	Some high school	0
	High school diploma	1
	Some college	39
	Associate/vocational degree	53
	Bachelor's degree	9
	Graduate/professional degree	2
	Other	0

INCOME:	Less than $6,000	6	$48,000-$53,999	11
	$ 6,000-$11,999	5	$54,000-$59,999	5
	$12,000-$17,999	7	$60,000 or more	38
	$18,000-$23,999	6		
	$24,000-$29,999	2	(Missing = 3)	
	$30,000-$35,999	8		
	$36,000-$41,999	6		
	$42,000-$47,999	7		

Method

Two stimulus news stories were rewritten to follow three schematic structures: (a) the prototypical Newsom and Wollert (1988) "modified inverted pyramid" news structure, (b) the Mandler and Johnson (1977) story grammar, and (c) the expository/attribution text structure described by Meyer (1975).

Subjects were randomly assigned to one of the six passage conditions--Passage I news, Passage I narrative, Passage I expository, Passage II news, Passage II narrative, or Passage II expository.

Each subject received a packet containing the measurement instruments. All measurement instruments and stimulus passages are included in Appendices A and B.

Subjects were first asked to complete the Media Use Survey.

Subjects were then presented with one of the two stimulus passages in one of the three organizational patterns. They were given sufficient time to read the passages; the stimuli were then removed.

Subjects were next asked to complete a multiple-choice questionnaire requesting demographic information, and then they were given the WIRE test.

Next, subjects were tested for strength of text schema by means of an unscrambling task based on three passages constructed according to prototypical narrative, news, and

expository structures. These passages were written by the author; the narrative story was based on the fable "The Owl Who Was God" by James Thurber (Thurber, 1941), the expository text was based on a passage used in the 1978 Florida Literacy Test (Morrison, 1978), and the news story was an Associated Press story. Each subject was given a labeled envelope containing a number of slips of paper; each scrap of paper was printed with a node from the scrambled stimulus passage. Subjects were instructed to organize the pieces of paper so that they formed a typical text passage of the type printed on the front of the envelope--either news, narrative ("story"), or expository ("textbook"). The structure of the passage used for the unscrambling task corresponded to the structure of the initial stimulus passage that each subject read. Once the subjects had arranged the pieces of the passage to their satisfaction, they were asked to number the scraps in sequence. Subjects' sequencing of each passage was compared to the original, parsed version of the passage, and a difference score was computed to determine the correlation between subjects' organization of the nodes and the actual, prototypical organization. Subjects' reorganizations of the passage were scored by comparing the relative order of propositions in the subject-generated passages to the original, correctly organized passages. Scores were computed by calculating rank-order correlation coefficients (Spearman's rho)

comparing subjects' ranking of the propositions to the rankings in the original passages (a full account of the scoring procedure is given in Appendix C; also see Hays, 1963, p. 645, for a more complete description of the calculation of difference scores and their use in computing rank-order correlation coefficients).

Various methods may be applied to the calculation of rank-order correlations. Perhaps the simplest way to calculate the proportion of pairs of items having the same relative position in two rankings is a graphic method. In this method, the objects ranked are listed, once in the order of the first ranking, and once in the order of the second. Then straight lines are drawn connecting the same objects in the two parallel rankings. This method, however, is time-consuming, and was therefore rejected in favor of the computation of difference scores based on calculating the numerical difference between two rankings x_i and y_i, such that the difference score $D_i = x_i - y_i$, and squaring the result. The sum of the squared differences was then used in the following formula to compute Spearman's rho, the rank order correlation coefficient:

$$r = 1 - \left[\frac{6 \sum D_i^2}{N(N^2 - 1)} \right]$$

After these three distractor tasks, subjects were asked to recall the stimulus passages and write them down using language as close to the originals as possible. Their

instructions included the caveat that if they were not able to remember the original wording of the passage, approximations were permissible.

Finally, subjects were asked to answer the comprehension questionnaire.

The recall instrument was administered one week later to the same subjects. Subjects were asked to recall the passage they had read and write it down using language as close to the original as possible.

Recalls were scored by parsing the subject-generated passages and recording the number of text elements recalled from the original for each node in the appropriate text grammar. These numbers were converted to percentages. A full explanation and example of the scoring procedure is given in Appendix C.

Analysis

To determine the overall effects of altering the structure of the stimulus news stories, an analysis of variance using the fixed-effects model was conducted to compare the mean recall and comprehension scores across the three text structure conditions for each of the two passages. Although the hypotheses, as stated above, focused on comparisons between pairs of means, the analyses of variance were efficient methods of summarizing the results. Each hypothesis was then tested by means of a t-test

comparing mean scores on the dependent variables as specified in the hypothesis.

All statistical analyses were performed using SPSS-X.

The level of significance generally used in this study was = .05, although if p lay between .05 and .10, the relationship was judged to be statistically significant. Rejecting the null hypothesis at the .05 level indicates that if the null were true, the probability would be less than .05 of obtaining a test statistic value as favorable to the alternative hypothesis as the one observed. This research was in a sense exploratory in that the method and the measurement instruments were developed for this study and had not been refined through years of experimentation; thus, the signficance levels used were to some extent flexible.

Some Considerations: Threats to External and Internal Validity

As is the problem with most experiments conducted in controlled conditions, any results obtained cannot easily be generalized beyond the laboratory situation, which presents a serious, and inevitable, threat to the external validity of the proposed study.

However, to compensate for this inherent flaw in the proposed method, threats to internal validity were minimized by randomizing subjects' assignment to the six experimental conditions, standardizing stimuli and experimental

conditions, and controlling for variables which may have interfered with the relationship being studied. These steps helped ensure that the manipulation of the independent variable was the cause of any observed variation in the dependent variables.

Internal validity in many experiments can be reduced because of maturation of subjects, mortality or attrition of the subject pool, history (i.e. some unexpected factor which may coincide with the independent variable and produce a similar effect), or reaction to a pretest. Since the proposed experiment was conducted within a fairly short time, it can be assumed that maturation, mortality, and history did not threaten this particular experiment. No stories similar to the stimulus passages appeared in local newspapers during that period. A pretest that may have interfered with performance on the measures of the dependent variables was not administered, so this threat to internal validity may also be ruled out; the absence of a pretest also eliminates any possibility of a regression toward the mean in scores on the dependent variable measures.

Any threat to internal validity that may be due to inadequacy of the measurement instruments was minimized by testing all measures for reliability and validity before they were used. Some attrition occurred between the administration of the first set of instruments and the test

of long-term recall, which may have affected the validity of these results to some extent.

Table 3-5

Conceptual and operational definitions

CONCEPTUALIZATION FOR PRESENT STUDY	OPERATIONALIZATION FOR PRESENT STUDY	BASED ON
Text schemas: An idealized mental representation of the informational units in a typical example of a particular type of text and the relationships among those units.	The correlation between a subject's organization of the propositions corresponding to nodes in a text passage of a given type and the sequence of those propositions in a well-formed version of that passage.	Mandler and Johnson (1977): We use the term "story schema" to refer to an idealized internal representation of the parts of a typical story and the relationships among those parts.
Text structures or text grammars: The underlying organizational pattern of the informational units in a text.	Parsing of stimulus passages to identify propositions corresponding to terminal nodes in story, news, and expository text grammars. Occasional rewriting of the passages to make them conform to identifiable grammars.	Stein and Glenn: (1979): Stories can be described in terms of a hierarchical network of categories and the logical relations that exist between those categories.

Table 3-5--continued

CONCEPTUALIZATION FOR PRESENT STUDY	OPERATIONALIZATION FOR PRESENT STUDY	BASED ON
Recall: (short-term and long-term): The degree to which a reader can retrieve, unaided, the information contained within a printed passage.	The proportion of propositions in the stimulus passage each subject was able to regenerate in writing after reading the passage.	Graesser and Nakamura (1982): When subjects receive recall tests, they are given the script title and they write down as many actions as they can remember (pp 69-70). LeVoi (1986): Free recall occurs when the subject is free to recall any items . . . and create and use helpful cues in any way he or she wishes (p. 105).
Comprehension: The degree of accuracy with which readers can use literal, inferential, and evaluative skills to process information contained in a text passage.	The percentage of correct responses to a nine-item questionnaire containing textually explicit, textually implicit, and scriptally implicit questions based on the stimulus passage.	Trabasso, van den Broek, and Liu (1988): In the assessment and promotion of understanding discourse, questions play a central role. The comprehender is asked questions in order to find out what he knows about the text

CHAPTER 4
RESULTS AND ANALYSIS

An investigation was conducted to determine whether altering the underlying organizational structure of a printed news passage would affect readers' recall and comprehension of the information contained in it. The independent variable in this experiment was the text structure of the passage, which was altered to follow a typical news, narrative, or expository structure. The dependent variables were short-term recall, long-term recall, and comprehension of the passage's informational content.

Two passages were used as stimuli in the experiment. Subjects were randomly assigned to read either the passage about a captive-breeding program to protect the Florida panther or the passage about a political uprising in Surinam.

General Results

The data were analyzed to test the hypotheses proposed in Chapter 3. Initially, separate one-way analyses of variance were conducted for each passage to compare the mean recall and comprehension scores of subjects in each experimental condition and summarize the observed results.

Detailed descriptions of these analyses as well as the statistics used to test each hypothesis are given below.

Manipulating the structure of the stimulus stories had somewhat different effects on each of the dependent variables.

Overall, it appeared that the subjects' short-term recall of the passages was significantly influenced by manipulation of the text structure, F (2,50) = 2.881, p = .065 for the panther passage and F (2,45) = 3.529, p = .038 for the political uprising passage (Table 4-1).

However, subjects' comprehension of the two passages, as measured by the ten-item questionnaire described in Chapter 3, did not appear to be significantly affected by the experimental manipulation overall, F (2,50) = 1.985, p = .148 for the panther passage and F (2,45) = 0.179, p = .836 for the political uprising passage (Table 4-2).

Long-term recall appeared to be significantly affected only in the case of the panther passage, F (2,35) = 3.102, p = .057; no significant differences were found for the political uprising passage, F (2, 25) = 0.907, p = 0.416 (Table 4-3).

Table 4-1

Analysis of variance of short-term recall across text structure

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG OF F
		Panther Passage			
Text Structure	1424.29	2	712.14	2.881	.065
Residual	12607.04	51	247.19		
Total	14031.33	53	264.74		
		Political Uprising Passage			
Text Structure	898.88	2	449.44	3.529	.038
Residual	5858.67	46	127.46		
Total	6757.55	48	140.78		

Table 4-2

Analysis of variance of comprehension across text structure

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG OF F
		Panther passage			
Text Structure	2471.57	2	1235.78	1.985	.148
Residual	32380.53	52	622.70		
Total	34852.10	54	645.40		
		Political Uprising Passage			
Text Structure	207.69	2	103.84	.179	.836
Residual	26641.98	46	579.17		
Total	26849.67	48	559.36		

Table 4-3

Analysis of variance of long-term recall across text structure

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG OF F
		Panther Passage			
Te4xt Structure	1007.14	2	503.57	3.102	.057
Residual	6006.75	37	162.34		
Total	7013.90	39	179.84		
		Political Uprising Passage			
Text Structure	155.64	2	77.82	.907	.416
Residual	2231.53	26	85.82		
Total	2387.172	28	85.25		

These broad trends were investigated in terms of the experimental hypotheses expressed in Chapter 3 by conducting a series of t-tests to study the differences in mean scores on the dependent variables between each pair of experimental groups. The results of these tests are discussed in the following sections.

Effects of Altering the Text Structure on Short-Term Recall

H1: A text passage written to follow a narrative story grammar will be better remembered in the short term than the same passage organized according to an expository text grammar or a news story grammar;

similarly, a text passage organized according to an expository text grammar will be better remembered than the same passage organized according to a news story grammar.

The hypothesis predicting associations between the text structure of a passage and short-term recall was, overall, supported.

This hypothesis was tested by comparing the mean short-term recall scores of subjects who read the narrative version of each of the two stimulus text passages to the mean short-term recall scores of subjects who read the expository and news versions of each of the two stimulus passages.

Results of the t-tests for each text condition are described below and shown in Tables 4-4 through 4-6.

Narrative Versus News Grammars

Panther passage

The mean short-term recall score of subjects who read the narrative version of the panther passage was significantly higher (M = 31.7) than the mean score of subjects who read the news version of this passage (M = 22.3), t (35) = 2.06, p = 0.024.

Political uprising passage

The data for the political uprising passage paralleled the findings for subjects who read the panther passage.

Those subjects who read the narrative version of the political uprising passage also displayed better short-term recall of the passage's content than did subjects who read the news version of this passage. The mean short-term recall score of subjects who read the narrative version was 25.3, while the mean recall score of the group that read the news version was 14.9. The t-test indicated a significant difference between these two groups, t (33) = 2.59, p = 0.007.

Table 4-4

Comparison of mean short-term recall scores of narrative story group with news story group

	N	MEAN	SD	SE	T	DF	P
			Panther Passage				
Narrative	17	31.7	12.83	3.11	2.06	33	.024
News	18	22.3	13.83	3.26			
			Political Uprising Passage				
Narrative	18	25.3	14.34	3.40	2.59	31	.007
News	15	14.9	6.50	1.68			

Thus, in the case of both text passage conditions, the narrative structure appeared to result in better short-term recall of the passages' content than the news version. Hypothesis 1 was supported.

Expository Versus News Grammars

Again, separate t-tests were performed for subjects in each text passage condition to compare the mean short-term

recall scores of subjects who read the expository version of each passage with those of subjects who read the news version of each passage. T-test results are reported below and given in Table 4-5.

Panther passage

The analysis showed that subjects had better short-term recall of the passage written according to an expository text structure (M = 34.2) than of the passage written according to the news story structure (M = 22.3), t (37) = 2.14, p = 0.020.

Political uprising passage

Again, in the case of the political uprising passage, the short-term recall of the expository version of the passage was higher (M = 21.1) than short-term recall of the news version of the passage (M = 14.9), t (31) = 1.93, p =0.032.

Thus, the second hypothesis was also supported by the experimental data.

Narrative Versus Expository Grammars

A third set of t-tests was conducted to compare subjects' short-term recall of the narrative version of each of the two passage to their short-term recall of the expository version of the each of the two passages. These results are given below and shown in Table 4-6.

Table 4-5

Comparison of mean short-term recall scores of expository text group with news story group

	N	MEAN	SD	SE	T	DF	P
			Panther Passage				
Expository	19	34.2	19.32	4.34	2.14	35	.020
News	18	22.3	13.82	3.25			
			Political Uprising Passage				
Expository	16	21.0	10.72	2.68	1.93	29	.032
News	15	14.9	6.50	1.67			

Panther passage

Although the mean short-term recall score of subjects who read the narrative version of the passage was found to be higher (M = 34.2) than that of subjects who read the expository version of the passage (M = 31.7), the differences were not statistically significant, t (36) = 0.46, p = 0.323.

Political uprising passage

Again, the short-term recall scores of subjects in the narrative condition were higher (M = 25.3) than those of subjects in the expository condition (M = 21.1), but the difference was not significant, t (34) = 0.97, p = 0.17.

Effects of Altering the Text Structure on Long-Term Recall

The hypothesis predicting that long-term recall of text content would vary with text structure was partially supported.

Table 4-6

Comparison of mean short-term recall scores of narrative story group with expository text group

	N	MEAN	SD	SE	T	DF	P
			Panther Passage				
Narrative	17	31.7	12.83	3.11	.46	34	.323
Expository	19	34.2	19.33	4.34			
			Political Uprising Passage				
Narrative	18	25.3	14.34	3.40	.97	32	.17
Expository	16	21.1	10.72	2.68			

H2: A text passage written to follow a narrative story grammar will be better remembered in the long term than the same passage organized according to either an expository text grammar or a news story grammar; similarly, a text passage organized according to an expository text grammar will be better remembered than the same passage organized according to a news story grammar.

Narrative Versus News Grammars

The mean long-term recall scores differed between the group of subjects exposed to the narrative versions of the text passages and the group exposed to the news versions of the passages. In general, it appears that the recall of the narrative version was better than the recall of the news version (see Table 4-7 for t-test statistics).

Panther passage

The mean long-term recall score for the group of subjects who read the narrative version of the panther passage (M = 23.7) was considerably higher than the mean score of the group of subjects who read the news version of the same passage (M = 12.2). This difference was found to be significant, t (27) = 2.38, p = 0.013.

Table 4-7.

Comparison of mean long-term recall scores of narrative story group versus news story group

	N	MEAN	SD	SE	T	DF	P
			Panther Passage				
Narrative	12	23.7	17.38	5.02	2.38	25	.013
News	15	12.2	6.30	1.63			
			Political Uprising Passage				
Narrative	12	14.4	8.05	2.32	1.65	17	.059
News	7	8.6	6.21	2.35			

Political uprising passage

The mean long-term recall score of the subjects who read the narrative version of the political uprising passage (M = 14.4) was again higher than the mean score for those subjects who read the news version (M = 8.6), and the difference approached significance, t (19) = 1.65, p < 0.059.

Expository Versus News Grammars

The results of the t-test used to explore this part of the second hypothesis were inconclusive. Subjects who read the expository version of the panther passage had a significantly higher mean long-term recall score (M = 21.2) than subjects who read the news version of the panther passage (M = 12.2), t (28) = 2.33, p =0.014. In the case of subjects who read the political uprising passage, while the mean recall score of those who read the expository version was higher (M = 13.1) than the mean score of those who read the news version (M = 8.6), this difference was not found to be statistically significant, t (17) = 0.91, p = 0.188. The t-test results are shown in Table 4-8.

Table 4-8.

Comparison of mean long-term recall scores of expository text group versus news story group

	N	MEAN	SD	SE	T	DF	P
			Panther Passage				
Expository	13	21.2	13.32	3.69	2.33	26	.014
News	15	12.2	6.30	1.62			
			Political Uprising Passage				
Expository	10	13.1	11.96	3.78	.91	15	.188
News	7	8.6	6.21	2.35			

Narrative Versus Expository Grammars

Here, differences in long-term recall between subjects who read the narrative versions and subjects who read the expository versions of the text passages were not statistically significant. T-test results are shown in Table 4-9.

Table 4-9

Comparison of mean long-term recall scores of narrative story group with expository text group

	N	MEAN	SD	SE	T	DF	P
			Panther Passage				
Narrative	12	23.7	17.38	5.02	.41	23	.344
Expository	13	21.2	13.32	3.69			
			Political Uprising Passage				
Narrative	12	14.4	8.05	2.32	.31	20	.381
Expository	10	13.1	11.96	3.78			

Panther passage

Altering the underlying text structure from narrative to expository did not affect long-term recall of the passage's content. The mean recall score of those reading the narrative version was 21.2 while the mean recall score of those reading the news version was 23.7, t (25) = 0.41, p =0.344.

Political uprising passage

Again, no significant differences were observed between the mean recall score of subjects who read the

narrative version of this passage (M = 14.4) and subjects who read the expository version (M = 13.1), t (22) = 0.31, p = 0.381.

Effects of Altering the Text Structure on Comprehension

The hypothesis predicting that subjects' comprehension of text content would vary with changes in text structure was partially supported in the panther passage condition but not at all in the political uprising passage condition.

Narrative Versus News Grammars

T-tests were conducted to compare the mean comprehension scores of subjects who read the narrative versions of the two text passages to subjects who read the news versions of the two passages. Results are shown in Table 4-10.

Panther passages

The mean comprehension of the narrative version of the panther passage was 52.6, significantly higher than the mean comprehension score of 40.9 for the news version, t (34) = 1.78, p = 0.021.

Political uprising passage

In the case of subjects assigned to read the political uprising passage, the mean comprehension score for subjects who read the narrative version of this passage was somewhat

Table 4-10.

Comparison of mean comprehension scores of narrative story group with news story group

	N	MEAN	SD	SE	T	DF	P
			Panther Passage				
Narrative	17	52.6	20.30	4.92	1.78	34	.021
News	19	40.9	19.08	4.38			
			Political Uprising Passage				
Narrative	18	39.6	20.29	4.78	-.41	31	.342
News	15	42.6	21.95	5.67			

lower (M = 39.6) than that for subjects who read the news version (M = 42.6). However, the difference was not statistically significant, t (33) = 0.41, p = 0.342.

Expository Versus News Grammars

The results of these t-tests, shown in Table 4-11, were mixed.

Table 4-11.

Comparison of mean comprehension scores of expository text group with news story group

	N	MEAN	SD	SE	T	DF	P
			Panther Passage				
Expository	19	56.4	32.69	7.50	1.79	36	.041
News	19	40.9	19.08	4.38			
			Political Uprising Passage				
Expository	16	44.4	29.33	7.33	.20	29	.423
News	15	42.6	21.95	5.67			

Panther passage

Subjects appeared to comprehend the passage written according to the expository structure better (M = 56.4) than the passage written according to the news structure (M = 40.9). This difference was significant (t (38) = 1.79, p = 0.041).

Political uprising passage

Again, the mean comprehension score of subjects in the expository structure condition was slightly higher (M = 44.4) than that of subjects in the news structure condition (M = 42.6), but the difference was not statistically significant (t (31) = 02.0, p = 0.423).

Text structure did not significantly affect comprehension across text passage conditions.

Narrative Versus Expository Grammars

The mean comprehension scores of subjects who read the narrative version of each passage were compared to those of subjects who read the expository version of each passage using a set of t-tests (see Table 4-12).

Table 4-12.

Comparison of mean comprehension scores of narrative story group with expository text group

	N	MEAN	SD	SE	T	DF	P
			Panther Passage				
Narrative	17	52.6	20.30	4.92	.42	34	.340
Expository	19	56.4	32.69	7.50			
			Political Uprising Passage				
Narrative	18	39.6	20.29	4.78	.57	32	.287
Expository	16	44.4	29.33	7.33			

Panther passage

The comprehension scores of subjects who read the expository version of the panther passage were slightly, but not significantly, higher (M = 56.4) than the scores of subjects who read the narrative version of the panther passage (M = 52.6), t (36) = 0.42, p =0.340.

Political uprising passage

Similarly, the comprehension scores of subjects who read the expository version of the political uprising passage were slightly, but not significantly, higher (M = 44.4) than those of subjects who read the narrative version (M = 39.6), t (34) = 0.57, p = 0.287.

Summary

In general, the hypothesis addressing the effects of manipulating the structure of a news story on short-term recall of the story's content was supported.

The hypothesis focusing on long-term retention of the text content was partially substantiated. Significantly more information appeared to be recalled from the narrative versions of both text passages as compared to the news versions, but while subjects' long-term recall scores were numerically higher for the expository versions than for the news versions of the passages, these differences were statistically significant only in the case of the panther passage. No significant differences in long-term recall were apparent between subjects who read the narrative versions of the passages versus those who read the expository versions.

The hypothesis which predicted that comprehension of a text passage's content would be affected by manipulation of the passage's structure was also only partially supported. Subjects appeared to have significantly better comprehension of the narrative and expository versions of the panther passage as compared to the news version, but no such differences in comprehension were observed for the political uprising passage. No substantial differences in comprehension were found between the narrative and expository versions of either passage.

Short-Term Recall of Text Content: A Closer Look

At first glance, the results described in the preceding sections would imply that texts structured according to a narrative grammar or an expository structure facilitate short-term recall much more than texts organized according to the news inverted-pyramid model. In the short term, subjects appear to recall a greater net quantity of information from narrative and expository versions of a text than from a news version.

But what precisely is recalled from each version of a particular passage? Mandler and Johnson (1978) in a similar experiment found that both children and adults tended to remember settings, beginnings, and outcomes from narrative passages, with adults also remembering attempts very well. Reactions and endings were not remembered as well by either age group. Meyer (1975) found that information "high" in the structure of an expository passage (i.e., near the beginning of the passage) was better recalled than information "low" in the passage. Given that most text passages contain main points and supporting details, recall of the key facts would generally be considered more desirable than recall of the extraneous information in the text.

Subjects' free-recall protocols were analyzed to examine the patterns of recall of the propositions representing terminal nodes in each experimental condition.

Panther Passage

The panther passage was presented to subjects in three versions: narrative, expository, and news. The analysis of subjects' short-term recall of each of these versions is discussed below.

Expository version

Subjects who read the expository version of the panther passage showed superior recall of the first node (in which the problem of the panther's extinction was stated), the fifth node (in which the solution to the problem--the captive breeding program--was described), and the eighth node, in which some features of the Florida panther were described (see Table 4-13).

The Florida panther passage was originally a news story. The key fact in the story, as evidenced by the lead sentence of the news version, was that a captive breeding program had been approved by federal and state officials to help prevent the extinction of the panther. In the expository version of the passage, this fact occurred in Node 5, which was one of the best-recalled nodes in the text.

Thus, not only was the proportion of recall in the expository version of this passage significantly higher than in the news version, but the key fact was well recalled in the expository version.

Table 4-13

Percentages of recall of the propositions representing each terminal node for the expository version of the panther passage

NODE RECALLED RECALLED IT	PERCENTAGE OF SUBJECTS WHO
Node 1 Statement of the problem--endangered status of the Florida panther	78.9%
Node 2 Setting trajectory--description of the shrinking range of the panther	74.9%
Node 3 Explanation--prediction of panther's extinction in 25-40 years	42.1%
Node 4 Specific--comparison of panther's status to other species' and description of panther population	36.8%
Node 5 Solution--description of captive breeding program	73.7%
Node 6 Explanation--explanation of need for captive breeding program	52.6%
Node 7 Specific--goal of program	47.4%
Node 8 Attribution--attributes of panthers	73.7%

[N=19]

Narrative version

Subjects in the narrative condition of the panther passage exhibited the best recall of the first node in the

story--the setting, in which the protagonist and the setting time and location were introduced (see Table 4-14). Every one of the 17 subjects who read this version of this story recalled something from this node, even though all the propositions in the node may not have been remembered by all the subjects.

Recall was also high for events, attempts, and outcomes, corroborating patterns of recall of narratives observed by Mandler and Johnson (1978).

While the data clearly indicate that subjects remembered the setting better than any other part of the narrative story, the key fact of the story (the approval of the captive breeding program), which occurred in Node 5, was also remembered well.

Again, not only was the net quantity of information recalled higher in the narrative version of the text than in the news version, the key fact was remembered by more than half the subjects.

News version

The inverted pyramid model for news story organization is built by placing the informational content of the story in descending order of importance. Readers are expected to read and absorb the more important facts before the less important information. However, the node-by-node analysis

Table 4-14

Percentages of recall of the propositions representing each terminal node for the narrative version of the panther passage

NODE RECALLED	PERCENTAGE OF SUBJECTS WHO RECALLED IT
Node 1 Setting--protagonist introduced, background information given	100.0%
Node 2 Event--shrinking range of Florida panther described	70.6%
Node 3 Internal reaction--protagonist's (and others') reactions to panther's plight described	64.7%
Node 4 Goal--protagonist's goal	11.8%
Node 5 Attempt--protagonist's involvement in captive breeding program	58.8%
Node 6 Outcome--projected outcome of program	47.1%
Node 7 Consequence--prediction that without intervention, panther will disappear in 20-40 years	29.4%

[N=17]

of the recall protocols for the news version of the panther text passage did not indicate such a trend (see Table 4-15).

In fact, readers showed superior recall of the last element in the inverted pyramid, denoted the "Details" node in the Newsom and Wollert (1988) inverted pyramid. In a news story, the least important information is placed in this node. Of the 19 readers who received the news version of the panther passage, 14 (73.7%) remembered something from this node.

The second-highest recalled node was the lead, which included the most important fact in the story; this node was recalled by 63.2% of the subjects.

The inverted pyramid organization of the news story contributes to subjects' ability to remember the information in the lead, but earlier data analysis showed that an overall lower proportion of information from the news version of the passage was remembered compared with the proportion of information recalled from the narrative and expository versions. On the basis of the data analysis above, it does appear that the key fact of the passage was equally well remembered in all three versions.

Table 4-15

Frequencies of recall of the propositions representing each terminal node for the news version of the panther passage

NODE RECALLED	PERCENTAGE OF SUBJECTS WHO RECALLED IT
Node 1 Setting--planned capture of ten Florida panthers described	63.2%
Node 2 Tie-in--approval of captive-breeding program and its general goal reported	52.6%
Node 3 Elaboration of lead--comment from wildlife official	36.8%
Node 4 Support for lead--second wildlife official's description of panther population	10.5%
Node 5 Background--comparison of status of panther to other endangered species'	31.6%
Node 6 Development of main idea--goal of program described	26.3%
Node 7 Details--attributes of panther	73.7%

[N=19]

Political Uprising Passage

The political uprising passage was rewritten into three text structures (news, narrative, and expository) that were presented as stimuli in the experiment. Subjects' recall of each of these versions is discussed in detail below.

Expository version

Subjects who read the expository version of the passage about the political uprising in Surinam appeared to remember propositions from the first, second and fifth nodes better than any others (see Table 4-16). The first node contained a topic sentence giving the theme of the passage. The second node described an incident in which soldiers broke through a barricade of pro-democracy demonstrators, allowing a military convoy to drive into the capital city. The sentences comprising the fifth node described a later incident in which 40 demonstrators were injured after storming the gate of a military base.

To determine what the key fact of this text passage was, it is necessary to look at the lead sentence of the news version of the passage. The sentence reads:

> Soldiers fought through a barricade of pro-democracy demonstrators on the outskirts of the South American city of Paramaribo Monday, injuring about 40 people and allowing a convoy of tanks and trucks to drive into the capital, witnesses said.

Table 4-16

Frequencies of recall of the propositions representing each terminal node for the expository version of the political uprising passage

Node	Percentage of subjects who recalled it
Node 1 Setting location--topic sentence describing passage's theme and geographical setting	75.0%
Node 2 Explanation--describes soldiers breaking through pro-democracy demonstrators, allowing convoy into city	56.3%
Node 3 Specific--details of the struggle	43.8%
Node 4 Setting trajectory--convoy's movements through city to base	37.5%
Node 5 Covariance--later incident; demonstrators storm base's gates; 40 injured	62.5%
Node 6 Specific--government's attempts to regain control of city	37.5%
Node 7 Consequent--government reaction	18.8%
Node 8 Alternative--description of political situation	25.0%
Node 9 Adversative--prediction of future political climate	18.8%

[N=16]

This information is contained in the first, second and fifth nodes of the expository version, which were the best-remembered nodes in that experimental condition. So the expository text structure appears to have facilitated recall of the key facts.

Again, a larger proportion of the passage was recalled from this version than from the news version, and the key facts were the ones best recalled by the subjects reading this version of the passage.

Narrative version

In this version of the passage, the key facts (as described above) were found in the second node (Event I), and the sixth node (Outcome).

In this experimental condition, the key facts were not the best recalled (see Table 4-17). Only half the subjects or fewer recalled the key facts. Here, the setting, the outcome, and the consequence were the nodes most frequently remembered by subjects reading this passage. Thus, organizing the information in this passage according to a narrative grammar resulted in high overall recall, but the passage's key points were not those best remembered.

Table 4-17

Frequencies of recall of the propositions representing each terminal node for the narrative version of the political uprising passage

NODE	PERCENTAGE OF SUBJECTS WHO RECALLED IT
Node 1 Setting--gives geographical and temporal location and background information	94.4%
Node 2 Event I--describes soldiers breaking through demonstrators to let convoy into city	44.4%
Node 3 Event II--describes movement of convoy through city	38.9%
Node 4 Internal reaction--demonstrators' reactions to military attack	5.6%
Node 5 Attempt--describes demonstrators storming gates of military camp	44.4%
Node 6 Outcome--40 people injured	50.0%
Node 7 Consequence--government reaction to incident	66.7%

[N=18]

News version

Subjects who read the news version of the political uprising passage remembered the key facts well--10 of the 15 subjects in this condition remembered something from the lead paragraph (see Table 4-18). Subjects also showed high recall of the third node, in which the main point was elaborated upon, and the seventh node, which contained the least important details.

The overall proportion of information recalled from the news version of the passage was lower than for the other two versions, but the best-recalled nodes were the two incidents key to the passage. Thus, it appears that for the political uprising passage, the news structure was conducive to recall of the key facts in the passage, if little else.

Summary of Analysis of Short-Term Recall Protocols

Closer examination of the short-term recall protocols indicated that key facts from the three versions of the passages were equally well remembered in each of the three structural conditions for the panther passage, while in the case of the uprising passage, key facts were equally well remembered in the expository and news versions but not the narrative version.

Table 4-18

Frequencies of recall of the propositions representing each terminal node for the news version of the political uprising passage

NODE RECALLED	PERCENTAGE OF SUBJECTS WHO RECALLED IT
Node 1 Lead--describes soldiers breaking through barricades of demonstrators to allow military convoy into city	66.7%
Node 2 Tie-in--describes soldiers	33.3%
Node 3 Elaboration on main point--movement of convoy; people's attack on military base	66.7%
Node 4 Support for the lead--attack was first sign of anatgonism from government	6.7%
Node 5 Background--describes history of demonstrations	13.3%
Node 6 Development of main idea--injuries	40.0%
Node 7 Details--government reaction, description of political climate	60.0%

[N=15]

Some Theoretical Implications: Correspondence of Strength of Text Schema with Recall and Comprehension

The statistical analyses described above indicated that the structure of a text passage had a significant influence on readers' overall short-term recall of the passage. In general, readers demonstrated superior net recall of the information in texts ordered according to expository and narrative structures than of texts according to an "inverted pyramid" news structure.

These observed phenomena would best be explained in terms of schema theory: Recall of the narrative and expository texts would be better if readers' schemas for the narrative and expository structures were better developed than their schemas for the news structure. In general, this should hold true for most individuals. Research indicates that narrative or story grammars are the text structures first acquired by most readers (Applebee, 1978). Expository structures are introduced in the early school years. Exposure to news structures occurs much later in developmental terms; thus, logically, news structure schemas would not be generally as firmly instantiated or as elaborate as schemas for the more familiar narrative and expository structures. In addition, regular newspaper readers would have better news structure schemas than those who do not read newspapers frequently.

The t-tests seemed to partially support this theoretical explanation in that the mean schema score for the narrative structure was generally higher in both passage conditions than the mean schema score for news structure (see Table 4-19). For subjects reading the "panther" passage, the mean schema score for narrative structure was 96.6, while the mean schema score for news structure was 71.6. For subjects reading the "uprising" passage condition, the mean schema score for narrative structure was 96.2, while the mean schema score for news structure was 83.3.

Table 4-19.

Comparison of mean strength of schema scores of narrative story group with news story group

	N	MEAN	SD	SE	T	DF	P
			Panther Passage				
Narrative	17	96.6	6.50	1.58	4.19	34	.000
News	19	71.6	23.78	5.46			
			Political Uprising Passage				
Narrative	18	96.2	6.85	1.61	2.83	31	.008
News	15	83.3	17.84	4.61			

Subjects generally seemed to possess better developed news schemas than expository schemas, although short-term recall of expository text was higher in both groups (see Table 4-20). For subjects who read the panther passage, the mean schema score for expository text was 53.0 while the

mean schema score for news text was 71.6. Similarly, for subjects who read the uprising passage, the mean schema score for expository text was 58.1, but the mean schema score for news text was higher--83.3. These results run contrary to the relationships predicted by schema theory, but may be a function of instrumentation, in that the passage used for the unscrambling task assessing strength of text schema was parsed into more elements than the news task.

Table 4-20.

Comparison of mean strength of schema scores of expository text group with news story group

	N	MEAN	SD	SE	T	DF	P
			Panther Passage				
Expository	19	53.0	24.53	5.63	-2.38	36	.012
News	19	71.6	23.78	5.46			
			Political Uprising Passage				
Expository	16	58.1	19.44	4.86	-3.75	29	.001
News	15	83.3	17.85	4.61			

It is conjecturable that subjects who frequently read newspapers would have better-developed schemas for the structure of printed news stories than readers who did not often read newspapers. Mean scores on the "strength of schema" task for subjects who received the news versions of the passages were compared on the basis of their responses to the media use survey regarding frequency of news reading.

Both media surveys contained the question, "How often would you say you read a newspaper?" Possible answers were:

(a) Never

(b) Infrequently

(c) Once a week

(d) A few times a week

(e) Daily or more often

Subjects answering (a) or (b) were grouped as infrequent newspaper readers, while those answering (c), (d) or (e) were grouped as frequent readers. Table 4-21 shows the t-test results when mean scores on the "strength of schema" task were compared between these two groups.

Table 4-21
Comparison of mean strength of news schema score between infrequent newspapers readers and frequent newspaper readers

	N	MEAN	SD	SE	T	DF	P
Frequent newspaper readers	8	73.1	26.35	7.95	0.32	17	0.755
Infrequent newspaper readers	11	69.5	21.29	7.53			

It will be seen that numerically, the mean score for strength of news structure schema was higher among readers who were frequent newspaper readers, but the difference was not statistically significant, perhaps due to the small number of subjects assigned to the "news" passage condition.

The notion that short-term recall may be related to strength of a subject's text schema for a particular text

structure was further examined by computing a Pearson product-moment correlation coefficient to measure the association between short-term recall and strength of text schema. In each experimental condition, a Pearson correlation coefficient was calculated between subjects' scores on the measure of short-term recall and the strength of their text schemas. These data are provided in Table 4-22.

Contrary to what might have been expected, significant correlations were not found in any of the six experimental conditions.

Table 4-22
Correlations between strength of text schema and short-term recall

PASSAGE	STRUCTURE	N	CORRELATION COEFFICIENT	P
Panther	Expository	19	.16	.260
Panther	Narrative	17	.19	.234
Panther	News	18	.15	.278
Uprising	Expository	16	.06	.418
Uprising	Narrative	17	.17	.248
Uprising	News	15	.10	.367

Scatterplots of short-term recall scores against strength of text schema scores clarify, to some extent, the lack of any significant association between these two variables.

Figures 4-1 through 4-6 show that subjects' scores within each experimental condition were not distributed

across a wide range. Rather, they tended to clump together, violating the underlying assumption of the Pearson product-moment coefficient that a straight line is the model for the relationship under scrutiny. While it is probable that an association exists between text schema and short-term recall of a passage, it is also possible that some ceiling effect might limit the extent of the correlation. Such an association could only be accurately measured using a larger group of subjects whose scores on both measures were distributed over a wider numerical range, so that any linear relationship between the two variables could be observed and analyzed.

The inital F and t-tests indicated that altering the structure of the texts had no significant effect on comprehension of the texts' content. Thus differential comprehension of the text passages is a function of some factor other than text structure.

Comprehension was measured in this study partly in terms of literal or factual information drawn from the stimulus texts and partly in terms of inferential and evaluative ability. The latter two skills depend almost entirely on readers' prior knowledge of the topic of the text. Thus, content schemas might supercede structure schemas insofar as comprehension is concerned. Such a finding would be consistent with results obtained by

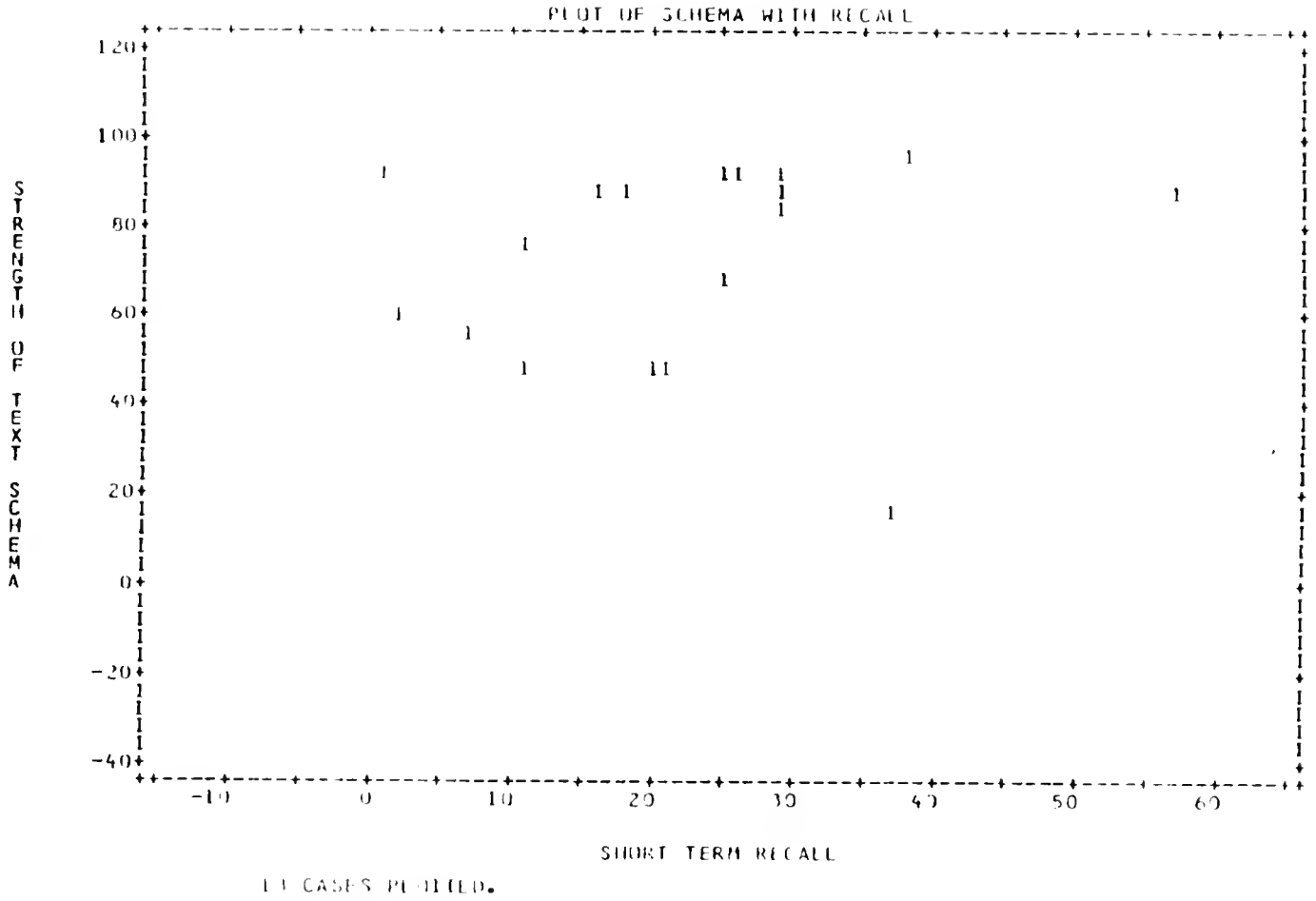

Figure 4-1. Plot of short-term recall scores against strength of text schema, panther story, news version

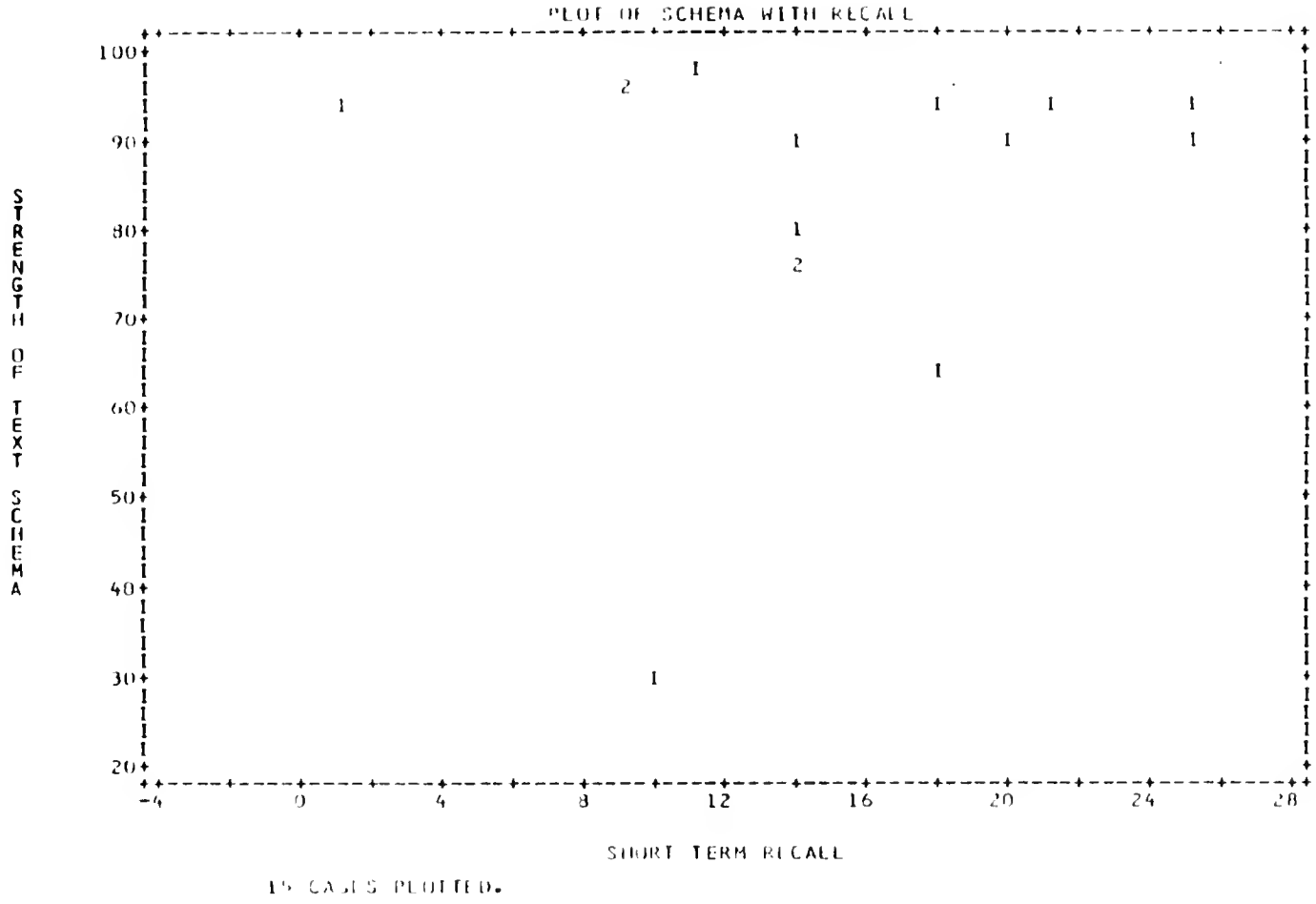

Figure 4-2. Plot of short-term recall scores against strength of text schema, uprising story, news version

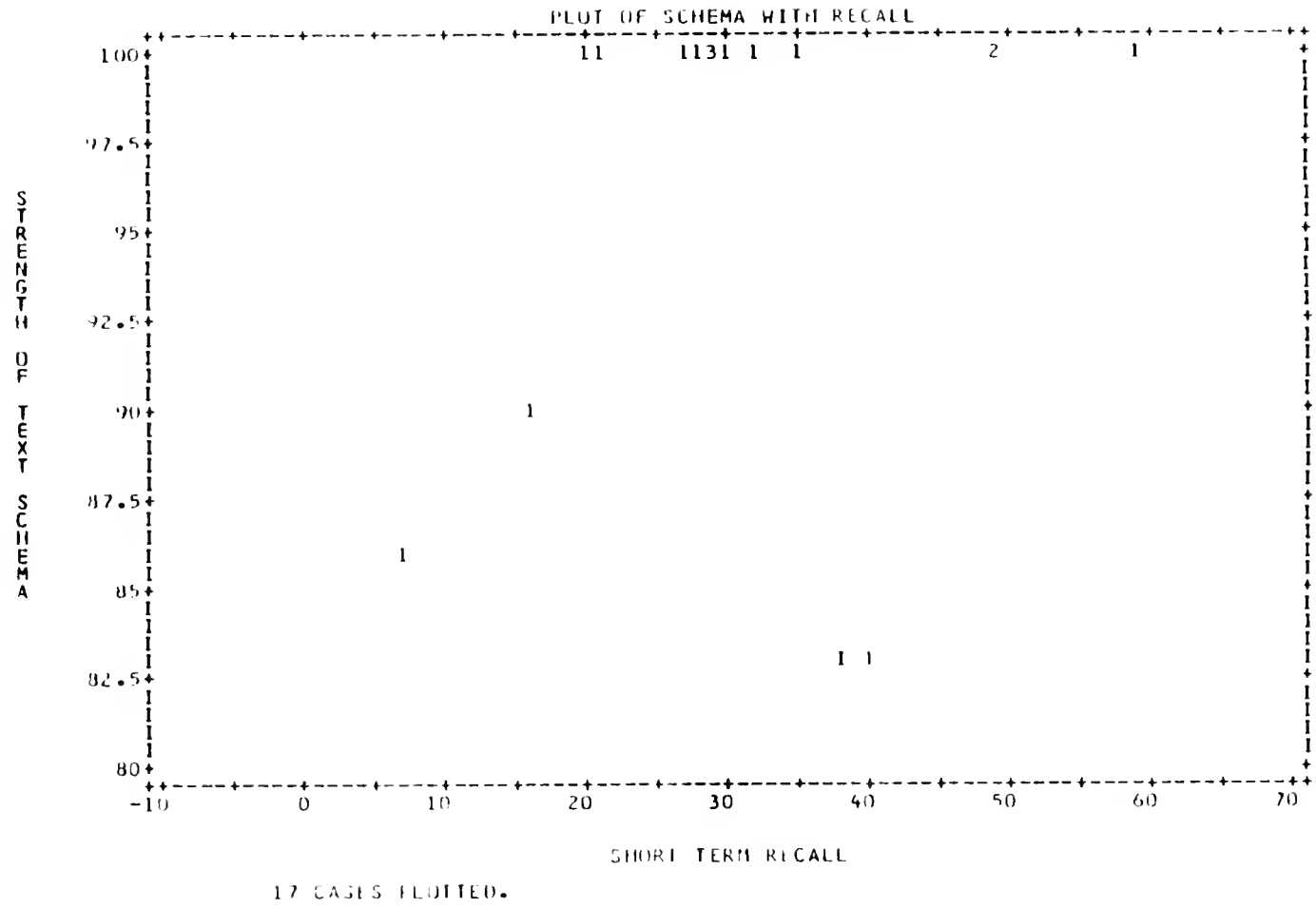

Figure 4-3. Plot of short-term recall scores against strength of text schema, panther story, narrative version

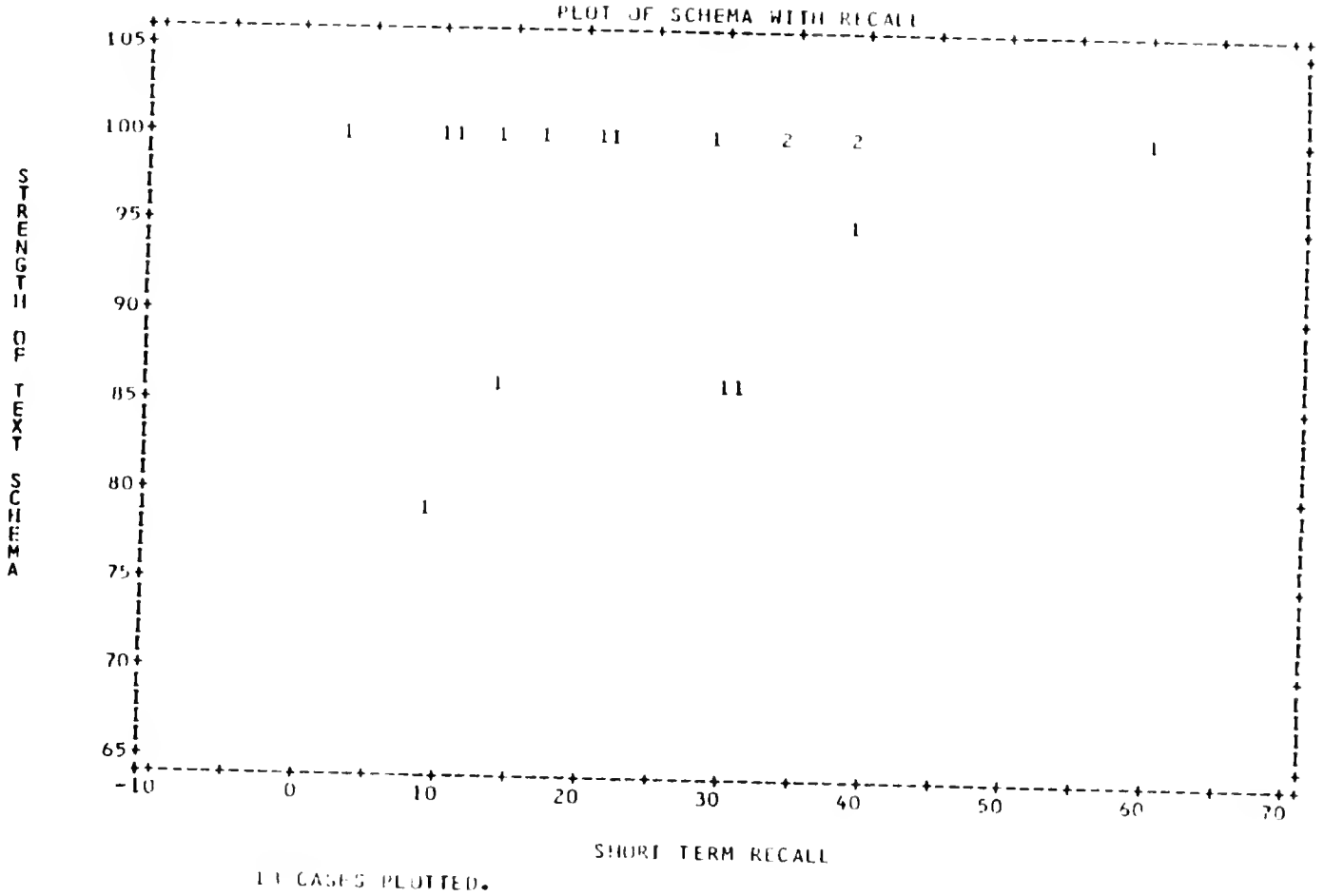

Figure 4-4. Plot of short-term recall score against strength of text schema, uprising story, narrative version

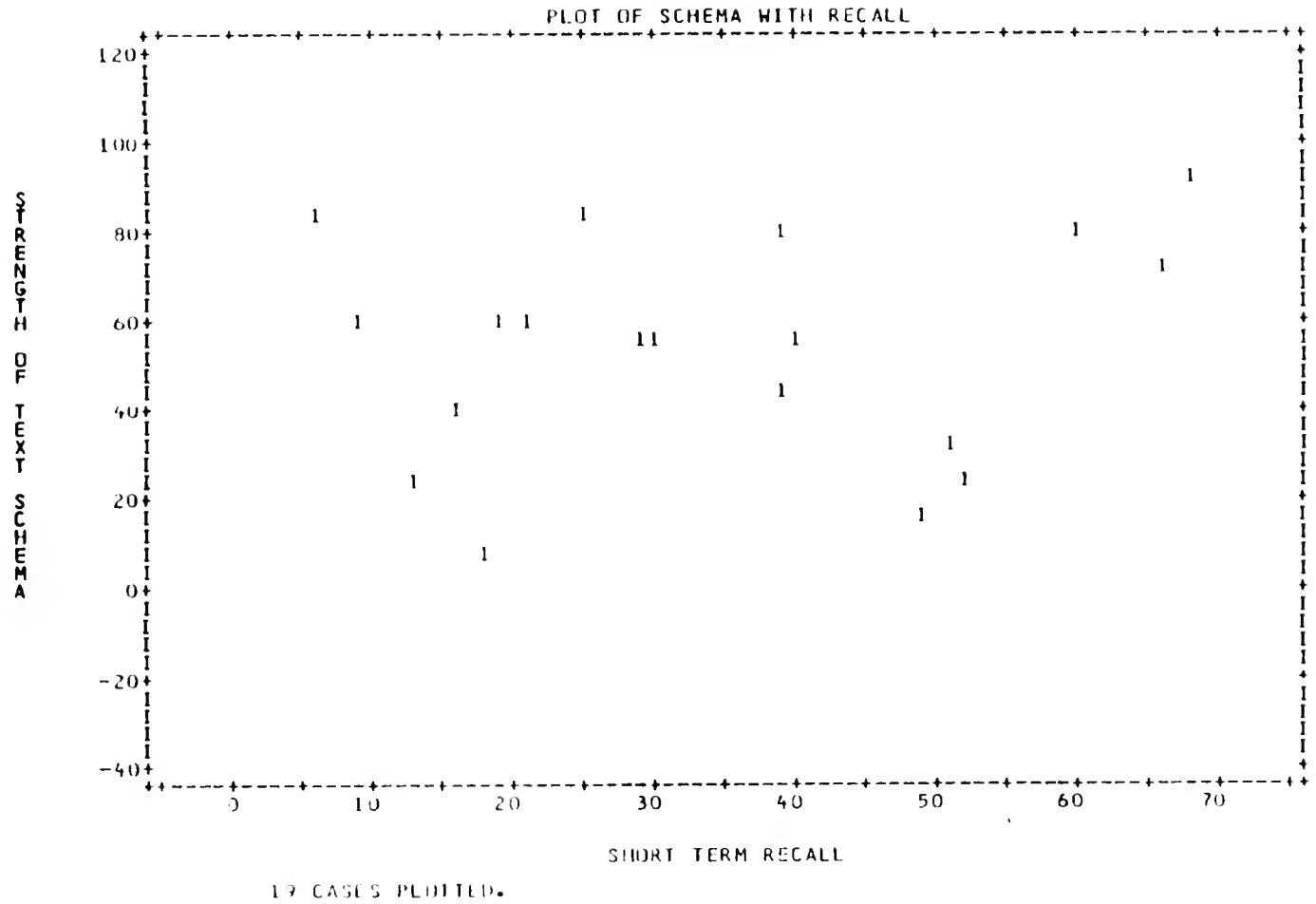

Figure 4-5. Plot of short-term recall scores against strength of text schema, panther story, news version

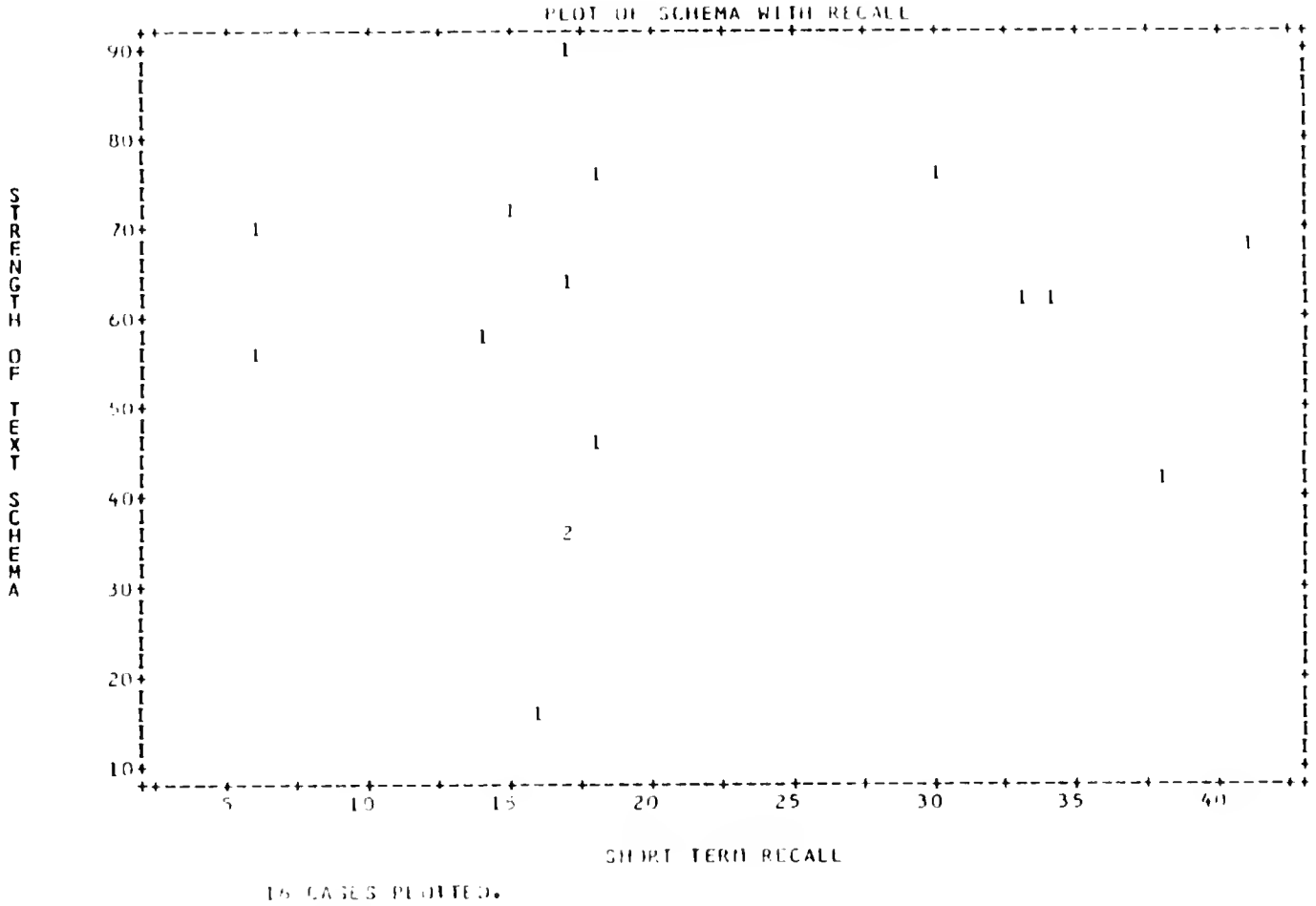

Figure 4-6. Plot of short-term recall scores against strength of text schema, uprising story, news version

Ohlhausen and Roller (1988), who found that when texts were well-structured, i.e. when they closely followed a familiar pattern of organization, content schemas played a more important role than text structures in the processing of the text content.

The idea that comprehension might depend more on subjects' content schemas than on their text schemas was tested by comparing the comprehension scores of subjects with high prior knowledge of the topics of the passages they read and subjects with low prior knowledge of the topics. Prior knowledge was assessed on the basis of the two general-knowledge questions asked at the end of the Media Use surveys (see Appendix A). Subjects who read the panther panther were asked to identify endangered species native to Florida from a list of six (the correct responses were the manatee, the bald eagle, and the panther) and to name the principal environmental regulatory agencies in Florida from a list of five (the correct responses were the U.S. Fish and Wildlife Service, the Florida Fish and Game Commission, and the Environmental Protection Agency). Subjects who read the uprising passage were asked to identify the countries that had experienced political upheaval in the last year from a list of six (correct responses were Rumania, China, Albania, Argentina, and Czechoslovakia) and to select the name of the president of Chile from a list of four (the correct answer was Augusto Pinochet).

Subjects scoring more than 70% on these multiple-choice responses (a grade of "C" by University of Florida standards) were designated as having high prior knowledge of the topic of the passage, while all others made up the "low prior knowledge" group. The mean comprehension scores of subjects in each of these groups were compared using a t-test (see Table 4-23).

Table 4-23

Comparison of mean comprehension scores of subjects with high prior knowledge versus subjects with low prior knowledge

Panther Passage

Prior Knowledge	N	MEAN	SD	SE	T	DF	P
High	4	59.5	17.18	8.59	0.78	53	.218
Low	51	49.1	25.91	3.63			

Political Uprising Passage

Prior Knowledge							
High	6	42.5	17.64	7.20	0.05	47	0.482
Low	43	42.0	24.54	3.74			

Contrary to expectations, no significant differences in comprehension were found between these groups in either passage condition (for the panther passage, t (55) = 0.78, p = 0.218; for the uprising passage t (49) = 0.05, p = 0.482).

Although these findings do not fit with what is known about the role of prior knowledge in comprehension, they may

be explained by the fact that the vast majority of the subjects had low prior knowledge of the topics. Thus, the size of the two groups compared in the t-tests were widely disparate, resulting in the observed lack of significance. It is entirely probable that content schemas may supercede text schemas in the comprehension process, but the data available in this study were not sufficient to analyze this possibility in any detail.

Comprehension scores were also compared on the basis of subjects' expressed interest in the topics of the two passages (see Table 4-24). Readers were asked to respond to the question, "Are you interested in keeping up with environmental and wildlife conservation issues?" before reading the panther passage and the question, "Are you interested in keeping up with international news events?" before reading the uprising passage (see the two Media Use surveys in Appendix A). Responses to this question were used as a measure of interest in the passage's content.

The range of possible responses to these questions was:

(a) No, not at all

(b) Not very interested

(c) Fairly interested

(d) Very interested

(e) Extremely interested

Table 4-24

Comparison of mean comprehension scores of subjects with high interest in the passage topic versus subjects with low interest in the passage topic

	N	MEAN	SD	SE	T	DF	P
			Panther Passage				
Low interest	33	43.5	20.10	3.50	2.36	53	.011
High interest	22	59.4	29.78	6.35			
			Uprising Passage				
Low interest	34	39.4	26.75	4.59	1.21	47	0.117
High interest	15	48.2	13.20	3.41			

Only two out of 104 subjects repsonded with, "No, not at all," so social desirability may have influenced the responses to some extent. Even students who admittedly never read a newspaper or listened to extended radio broadcasts, and only infrequently watched television news, assessed their own interest in these topics as being in the mid-range (see Table 4-25). Therefore, subjects responding to the interest question with either (a), (b), or (c) were grouped together as having low interest in the topic, while subjects responding with (d) or (e) were classified as the high-interest group.

Results of the t-test used to compare mean comprehension scores for subjects with low interest in the topic of the passage and subjects with high topic interest

Table 4-25

Cross-tabulations of frequency of news media use with interest in passage topic

INTEREST IN PASSAGE TOPIC	FREQUENCY OF NEWSPAPER READING					
	Never	Infrequently	Once a week	A few times a week	Daily or more often	Total
Not at all interested	0	1	0	1	0	2
Not very interested	0	8	3	5	0	16
Fairly interested	1	10	8	25	5	49
Very interested	0	7	3	10	5	25
Extremely interested	0	3	1	5	3	12
Total	1	29	15	46	13	104

Table 4-25--continued

FREQUENCY OF TELEVISION NEWS VIEWING

INTEREST IN PASSAGE TOPIC	Never	Infrequently	Once a week	A few times a week	Daily or more often	Total
Not at all interested	0	1	0	1	0	2
Not very interested	0	4	5	5	2	16
Fairly interested	1	9	7	23	9	49
Very interested	0	6	1	12	6	25
Extremely interested	1	1	2	3	5	12
Total	2	21	15	44	22	104

Table 4-25--continued

FREQUENCY OF RADIO NEWS LISTENING

INTEREST IN PASSAGE TOPIC	Never	Infrequently	Once a week	A few times a week	Daily or more often	Total
Not at all interested	1	1	0	0	0	2
Not very interested	10	4	0	2	0	16
Fairly interested	23	19	2	5	0	49
Very interested	10	12	1	0	2	12
Extremely interested	4	4	1	3	0	12
Total	48	4	1	3	0	12

indicate that interest appeared to increase comprehension of both passages, though the observed differences in mean comprehension scores were significant only in the panther passage condition.

Comprehension: A Closer Look

The nine-item questionnaires used to assess subjects' comprehension of the two stimulus passage contained questions constructed according to the criteria outlined by Pearson and Johnson (1978) for textually explicit, textually implicit, and scriptally implicit assessment questions, as described in an earlier chapter.

The initial analysis of the overall comprehension scores of subjects in each experimental condition indicated no consistent effect of altering the text structure on comprehension of the passages' content.

To recapitulate, subjects appeared to have significantly better comprehension of the narrative and expository versions of the panther passage as compared to the news version, but no such differences in comprehension were observed for the uprising passage. No significant differences in comprehension were found between the narrative and expository versions of either passage.

To attempt to find an explanation for the patterns of comprehension observed in these analyses, subjects' comprehension scores were broken down into three separate

scores: comprehension of the textually explicit questions, comprehension of the textually implicit questions, and comprehension of the scriptally implicit questions.

The textually explicit questions tapped literal recall of selected facts in the stimulus passages. The textually implicit questions required subjects to combine their recall of the passage's information with their own prior knowledge of the topic. The scriptally implicit questions were based entirely on subjects' prior knowledge of the topic.

Because short-term recall varied according to the text structure of the stimulus passage, it would be expected that subjects' literal comprehension, based on the textually explicit questions, would vary in the same manner. This was, in fact, found to be the case for the panther passage, as shown by a series of t-tests conducted to compare the mean scores for each type of comprehension in each of the experimental conditions (see Table 4-26).

For the panther passage, the mean comprehension score for the textually explicit questions was 48.3% in the narrative condition and 44.6% in the expository condition--slightly, but not significantly higher, for the narrative than for the expository structure (t = 0.34, p = 0.365). The mean comprehension score on the textually explicit questions in the news condition was 30.5%--significantly lower than in the expository condition (t = 1.78, p = 0.042) and the narrative condition (t = 1.77, p =0.043).

Table 4-26

Comparison of mean comprehension scores on textually explicit questions, textually implicit questions, and scriptally implicit questions

	N	MEAN	SD	SE	T	DF	P
			Panther Passage				
Textually explicit questions							
Expository	19	44.6	27.51	6.31	.34	34	.368
Narrative	17	48.3	37.93	9.20			
Textually implicit questions							
Expository	19	52.6	39.87	9.15	.03	34	.490
Narrative	17	52.9	31.72	7.69			
Scriptally implicit questions							
Expository	19	54.6	27.84	6.39	.80	34	.215
Narrative	17	62.7	33.69	8.17			
Textually explicit questions							
Expository	19	44.6	27.51	6.31	1.78	36	.042
News	19	30.5	20.94	4.80			
Textually implicit questions							
Expository	19	52.6	39.87	9.15	.47	36	.319
News	19	47.4	27.51	6.31			
Scriptally implicit questions							
Expository	19	54.6	27.84	6.39	.90	36	.186
News	19	46.5	27.43	6.29			
Textually explicit questions							
Narrative	17	48.3	37.93	9.20	1.77	34	.043
News	19	30.5	20.94	4.80			

Table 4-26--continued

	N	MEAN	SD	SE	T	DF	P
Textually implicit questions							
Narrative	17	52.9	31.72	7.69	.56	34	.288
News	19	46.5	27.43	6.29			
Scriptally implicit questions							
Narrative	19	54.6	27.84	6.39	.90	36	.186
News	19	46.5	27.43	6.29			
Political Uprising Passage							
Textually explicit questions							
Expository	16	35.3	21.69	5.42	1.38	32	.089
Narrative	18	25.2	21.18	4.99			
Textually implicit questions							
Expository	16	46.9	39.66	9.92	.19	32	.424
Narrative	18	44.4	33.82	7.97			
Scriptally implicit questions							
Expository	16	41.8	21.36	5.34	-1.45	32	.078
Narrative	18	55.1	30.22	7.12			
Textually explicit questions							
Expository	16	35.3	21.68	5.42	.20	29	.420
News	15	33.5	28.42	7.34			
Textually implicit questions							
Expository	16	46.8	39.66	9.92	.15	29	.442
News	15	45.0	30.18	7.79			
Scriptally implicit questions							
Expository	16	41.8	21.36	5.34	-.59	29	.562
News	15	47.8	33.91	8.76			

Table 4-26--continued

	N	MEAN	SD	SE	T	DF	P
Textually explicit questions							
Narrative	16	35.3	21.69	5.42	.20	29	.420
News	15	33.5	28.42	7.34			
Textually implicit questions							
Narrative	16	46.8	39.66	9.92	.15	29	.442
News	15	45.0	30.18	7.79			
Scriptally implicit questions							
Narrative	16	41.9	21.36	5.34	-.59	29	.281
News	15	47.8	33.91	8.76			

As expected, these results parallel those observed for short-term recall of the three versions of the panther passage.

In the case of the political uprising passage, the mean comprehension score on the textually explicit questions in the expository version of the passage was 35.3%, while that in the narrative version was 25.2%. This difference was not in the expected direction, since literal comprehension appeared to be lower in the narrative condition than in the expository condition, and the difference approached statistical significance (t = 1.38, p = 0.089). The mean literal comprehension score in the news version of the political uprising passage was 33.5%--not significantly lower than that in the expository condition (t = 0.20, p = 0.420) or significantly higher than that in the narrative condition (t = 0.96, p = 0.172).

Because the textually implicit questions were partially, and the scriptally implicit questions entirely, based on subjects' prior knowledge of the topic, the comprehension scores based on these two sets of questions were not expected to vary with text structure; nor did they.

The mean comprehension score based on the textually implicit questions was 52.6% in the expository condition, 52.9% in the narrative condition, and 47.4% in the news condition for the panther passage. No significant differences were found for these scores between the

expository and narrative conditons (t = 0.03, p = 0.490), the expository and news conditions (t = 0.47, p = 0.320), or the narrative and news conditions (t = 0.56, p = 0.288).

Similarly, in the political uprising passage, no significant differences were found for textually-implicit comprehension between the expository (M = 46.9%) and the narrative (M = 44.4%) conditions (t = 0.19, p = 0.424), the expository and news (M = 45.0%) conditions (t = 0.15, p = 0.442), or the narrative and news conditions (t = 0.05, p = 0.480).

Text structure should not have affected comprehension based on the scriptally implicit questions, either. In the case of the panther passage, the mean comprehension score for scriptally implicit questions was 54.6% in the expository version and 62.8% in the narrative version (t = 0.80, p = 0.215); it was 46.5% in the news version, not significantly lower than the expository version (t = 0.90, p = 0.186). However, statistically signficant differences in this sort of comprehension were observed between the news version and the narrative version (t = 1.6, p = 0.059).

For the political uprising passage, significant differences were not observed in comprehension based on scriptally implicit questions between the expository passage (M = 41.9%) and the narrative passage (55.1%) (t = 1.45, p = 0.078), the expository passage and the news passage (M =

47.8%, $\underline{t}$ = 0.59, $\underline{p}$ = 0.281), or the narrative passage and the news passage ($\underline{t}$ = 0.65, $\underline{p}$ = 0.261).

It is possible that the inconsistent patterns of comprehension scores stems from the fact that the majority of the subjects (94 out of 104, or 90 percent) had low prior knowledge of either of the topics of the passages (see Table 4-23).

Summary of in-depth analysis of comprehension scores

Subjects' comprehension scores were analyzed on the basis of question types. In the panther passage condition, literal comprehension (measured by the textually explicit questions) differed significantly between passage conditions. Inferential and evaluative comprehension, assessed by the textually and scriptally implicit questions, apparently were not affected by passage structure.

In the uprising passage condition, literal comprehension differed significantly between the narrative and expository versions, but significant differences were neither observed between the narrative and news versions nor between the expository and news versions. No significant differences were found for comprehension based on textually implicit questions in the three conditions, but comprehension based on the scriptally implicit questions was

significantly higher in the narrative condition as compared with the news condition, though not for any other pairs of structures.

General Summary

Overall, it was found that altering the structure of news stories had a significant effect on the short-term recall of those stories but not on subjects' comprehension of the stories. In the short term, subjects remembered stories that followed narrative and expository structures better than stories following an inverted pyramid news structure.

The results of altering text structure on long-term recall were inconclusive: subjects appeared to remember the narrative versions of the stimulus text passages better than the news versions, but superior recall of the expository version as compared with the news version was only observed in one passage condition. No significant differences in long-term recall were found between subjects who read the narrative version and subjects who read the expository version.

Subjects were found to exhibit stronger schemas for the narrative structure than for the news structure, although the findings did not indicate stronger schemas for expository text structure than news structure.

Closer examination of the short-term recall protocols indicated that key facts from the three versions of the passages were equally well remembered in each of the three structural conditions for the panther passages, while in the case of the uprising passage, key facts were equally well remembered in the expository and news versions but not the narrative version.

Subjects' overall comprehension was not significantly different in any of the three structural conditions for the uprising passage, while it was significantly higher for the narrative and expository versions as compared with the news version of the panther passage.

When subjects' aggregate comprehension scores were broken down into separate scores for textually explicit, textually implicit, and scriptally implicit questions, it was found that in the panther passage condition, literal comprehension (measured by the textually explicit questions) differed significantly between passage conditions, while the comprehension tapped by the textually and scriptally implicit questions, based largely on prior knowledge, was not affected by passage structure.

However, in the case of the uprising passage, literal comprehension differed significantly only between the narrative and expository versions. Significant differences were neither observed between the narrative and news versions nor between the expository and news versions. No

significant differences were found for comprehension based on textually implicit questions in the three conditions. A significantly higher mean comprehension score, based on the scriptally implicit questions, was observed for the narrative condition as compared with the news condition, though not for any other two sets of text structures. The inconsistent pattern of comprehension scores may be due to the generally low level of topic knowledge among the subjects. Significant differences in comprehension based on subjects' prior knowledge of the passage's topic were not observed; however, subjects' interest in the passage's topic was found to increase comprehension significantly in the panther passage condition.

CHAPTER 5
DISCUSSION

The study described in the preceding chapters showed that altering the structure of a news story to conform to narrative and expository structures significantly enhanced short-term recall of the story's content. However, altering the story's structure did not appear to affect comprehension of the story in the same way: the patterns of comprehension in the different text structure conditions varied according to the topic of the text passage. Overall, long-term recall seemed to be affected by the alteration of the story's structure, with significant differences found between recall of the narrative and news structures. Differences were found between recall of the expository and news structures, but the difference was statistically significant only in the case of one story. No differences in long-term recall of the expository and narrative structures were seen.

Theoretical Implications

The results of the research support the general hypothesis that text structure affects short-term recall of text content. This result can be explained on the

theoretical grounds that generally, readers have better-developed schemas for the structures of narrative and expository text, to which they are exposed early in life, than for the structure of news text, which is often first encountered in adolescence or later (see Nolan, 1989). The data indicate that readers' structural schemas for narrative texts are indeed significantly stronger than their schemas for news text.

Although the experimental data obtained from this research did not establish that readers' structural schemas for expository text were significantly stronger than their schemas for news text, this result is possibly a consequence of poor instrumentation in the choice of story used for assessing strength of expository text schema. The expository passage was longer, more complicated, and parsed into more segments than the news and narrative stories used in this assessment. The narrative story was sectored into seven elements representing the terminal nodes in a story grammar according to the Mandler and Johnson (1978) representation. The news story was also sectored into seven elements based on the Newsom and Wollert (1988) inverted pyramid. But the expository text was divided into 12 parts representing rhetorical predicates that described the relationships between the ideas in the passage's content structure, according to Meyer's (1975) formulations. Subjects given the task of unscrambling the expository

story, therefore, had to rearrange 12 separate elements instead of seven. This could explain the lower overall structural schema scores of subjects in the expository text condition.

Readers' comprehension of the stimulus passages appeared to depend much more on their responses to passages' content than on the structure of the passage: Significant differences were found in comprehension scores between the narrative and news versions of the panther passage and between the expository and news versions of that passage, but no such differences were observed for the uprising passage. This appeared to be a function of subjects' interest in the topic. Twenty-two out of 55, or 40 percent, of the subjects reading the panther story expressed a high degree of interest in conservation topics, compared to 15 out of 49, or 30 percent, who expressed high interest in political news.

Prior knowledge also has long been acknowledged as a significant factor in the comprehension of written text (Pearson, Hansen, & Gordon, 1979; Stahl & Jacobson, 1986; Just & Carpenter, 1984). This factor may actually be more influential than text structure when a reader is called on to make text-based inferences and judgements. In this study, most subjects exhibited low prior knowledge of the topics of both stimulus passages used, so assessment of the impact of prior knowledge on comprehension was difficult.

However, it possible that some degree of interaction may occur between prior knowledge and text structure.

To some extent, the changes in long-term recall occurring as a result of altering the structures of the stories appeared to follow those observed for short-term recall. Marked differences were observed between long-term recall of the narrative structure as compared with long-term recall of the news structure of both passages. Significantly higher long-term recall of the expository structure as compared with the news structure was found in the case of the panther story, but not in the case of the uprising story. This may again have been due to subjects' generally low interest in the political topic combined perhaps with slightly weaker text schemas for expository structure. In general, the observed differences in long-term recall would appear to be a function of the strengths of subjects' text schemas, with the text structure for which subjects showed stronger schemas being recalled better than the structures for which subjects did not have as strong schemas.

In general, lower mean scores on all measures of the dependent variables were observed for the uprising passage as compared with the panther passage. This could have been due to the fact that the uprising passage was written at the 15th-grade level, as opposed to the 13th-grade readability level of the panther passage. The uprising passage was also

longer and contained a greater number of details than the panther passage: Thus, a ceiling effect could have been imposed in that subjects receiving the panther passage could not score over a certain maximum percentage on the recall measures in terms of the number of propositions recalled from the passage.

A few previous studies in mass communication have addressed the effects of altering the organization of news stories, but most of these were fairly informal studies wherein the texts used were not parsed according to identifiable underlying grammars, the structures were not systematically altered to adhere to those grammars, and the findings did not have theoretical support. Donohew (1982), for example, rewrote two news stories to follow a more narrative style, which he defined as the chronological ordering of facts along with more adjectives and active verbs than are normally used in a news story and more direct quotes. He found that readers responded more positively to the narrative style on measures of physiological arousal and mood. Housel (1984) compared recall and comprehension of a television news story to that of the same story written to follow a narrative structure, but did not specify how the narrative version was organized. He found no significant effects of story structure on the dependent variables. Thorndyke (1979), in a similar study, rewrote four news stories to follow a narrative structure, which he defined as

a chronological ordering of facts. He did not find that altering the structure in such a way systematically affected recall or comprehension of the stories. Rather, some of the stories were better recalled in the narrative form while others were not, leading Thorndyke to conclude that "different organizations were optimal for different stories" (p. 107).

Nolan (1989) also rewrote inverted pyramid stories to follow a chronological form but did not find that familiarity with a particular organization affected ease of reading as measured by reading time. However, his subjects recalled the "gist" of the stories better in the inverted pyramid form than in the chronological form.

These results appear to directly contradict the results obtained in the present research. An explanation of this could be that the roughly "chronological" ordering of the events in the stimulus stories used in the above experiments was not recognized by the subjects as a well-formed narrative structure. The basic nodes in the Mandler and Johnson (1977) story grammar have been identified as the common underlying elements of basic simple stories. Relationships between nodes in the Mandler and Johnson grammar are not always simply chronological: they may be also be simultaneous, where two nodes are connected through the notion of concurrent activity or temporally overlapping states, or causal, where one node provides a reason for the

occurrence of a subsequent node. A simple chronological ordering of events might not take into account these alternative relationships between occurrences in a story and might not be recognizable to readers as a story grammar.

Because the narrative passage used in this experiment closely followed the Mandler and Johnson story grammar, subjects' story schemas may actually have been activated and the stories more easily processed.

Problems Encountered and Possible Solutions

One problem brought to light after the analysis of the data collected in this study was the flawed instrument used to measure the strength of subjects' schemas for the structure of expository text. The passage used was parsed into a greater number of elements than the passages used to assess the strength of structural schemas for narrative and news structures. In a future study along these lines, the expository passage used for this unscrambling task should be divided into the same number of terminal nodes as the other two stories and should be of the same overall length and readability.

A second possible impediment to the experiment was the fact that the two original news stories could not be rewritten to follow "perfect" narrative or expository structures. The panther passage had a protagonist in the narrative version, but it could be argued that a goal was

implicit in the setting of the story in the phrase, "Dennis Jordan frowned at the last entry in his journal," where the frown is possibly indicative of a desire to combat the stated problem of the endangered status of the Florida panther. The political uprising news story in its narrative form was not an ideal story in that it had no single protagonist--the demonstrators were substituted for this component. As for expository writing, the uprising passage was much better suited to a narrative grammar than an expository/attribution grammar because of its clear sequence of events building up to an outcome. The panther story, however, was fairly easily rewritten to follow a good expository text structure. Problems in recall and comprehension may have been caused by forcing the passages into organizational patterns to which they were not well suited.

In addition, the three text structures used in this research--news, narrative, and expository--were based on structural grammars developed by different researchers at three different times. The elements of the three structures could not be directly compared. The parsing of the passages in the three structural versions was done according to three different sets of rules. Parsing the passages according to a single, universally applicable text grammar might have resulted in recall protocols in the three versions that

could more easily have been compared and analyzed on some common basis.

In this study, subjects were instructed to read the stimulus stories and later to recall them and answer questions about them. This procedure did not really simulate the normal newsreading process. Thus, while the study isolated the variable of story structure and examined its effects on reading recall and comprehension, the actual impact of varying the structure of a news story on these processes during normal newsreading has still not been evaluated. A study in which the stimulus stories are embedded in a facsimile newspaper might be an improvement on the method used here.

A fourth problem involved the overall experimental design. The results observed in the experiment could have been caused by interactions between the text structures and the strength of subjects' text schemas as well as perhaps their schemas for the content of the text. The method employed in this study did not include the assessment of each subject's schema for all three types of structure--news, narrative, and expository. Had this been measured, the design of the experiment could have been a repeated-measures design. This would have allowed for a more complex and sensitive analysis of the observed variations in recall and comprehension.

In addition, subjects in this study showed generally low levels of prior knowledge of the topics of both stimulus passages. A study using subjects with a wider range of levels of prior content knowledge would be of greater benefit to analysis of interactions of content and text schemas.

Suggestions For Further Research

The procedures outlined in this study describe a method of analyzing certain aspects of the assimilation of printed news stories during the reading process. However, this inquiry adds only a fragment of knowledge to an area of investigation still relatively new in mass communication. The individual receiver's cognitive processing of mass media messages is a subject that could be explored in far greater breadth and depth in future studies.

As was suggested above, the strength of the reader's schema for the structure of the story could interact with the grammar of the story to affect recall and comprehension of the story's content. An elegant way to measure the interactions of subjects' text schemas with the text grammars of the stimulus passages would be to adminster all three stimulus passages and all three schema measures to all subjects. Such a study would necessitate the employment of a randomized block design involving repeated measures. A study along these lines would provide a greater understanding of the ways in which the organization of the

news story affects the cognitive processing of its content.

A third factor affecting these variables is prior knowledge of the story's topic--the strength of the reader's content schema. This variable should also be included in an analysis of this type.

The greater strength of readers' schemas for narrative and expository text structures, as observed in this research, was explained in terms of the developmental acquisition of text schemas. Research indicates that people acquire story schemas at a very young age. Nonfiction text structures are introduced somewhat later, but still fairly early in developmental terms--sometime in the early school years. However, little information is available regarding the acquisition of news schemas. How are they acquired? When are they acquired? Why are they apparently not as firmly instantiated as other text schemas? Do the recall and comprehension of news information increase with developmental maturation? If so, why? Information about these aspects of the formation of news schemas would increase our understanding of news readers and their orientations to news messages.

This study focuses solely on printed news stories--specifically, newspaper stories. An examination of text structures used in other media and the effects of altering them might reveal more about information gain from other sources of news.

Implications for the Field

On the basis of the patterns of recall and comprehension observed in this study, it would appear that the "inverted pyramid" typically used as an organizational model by news writers is not always the text structure that would best facilitate recall or comprehension. Past research has supported the view that narrative writing is better received by readers than news stories. For instance, Donohew (1982) found that narrative-style stories, i.e. chronologically ordered stories that make use of "punchy" verbs and adjectives, produced greater physiological arousal and more favorable responses than traditional inverted-pyramid news stories. Berner (1983) noted that "one drawback to good newswriting was the inverted pyramid" (p. 33). The inverted pyramid style discourages the use of traditional elements of language that lend lexical cohesiveness and logical coherence to text, instead relying on stylistic codes that often hinder comprehension (Smith & Voelz, 1983). In light of these findings, the inverted pyramid structure that serves as the prototype for news stories could be modified to optimize reading recall and comprehension.

In this study, the narrative and expository versions of the two passages were best remembered by readers, with no significant differences between recall of these two structure in the case of either stimulus text passage. As

was mentioned earlier, the panther passage appeared to be more suited to the expository grammar than the political uprising passage, while the latter appeared to be more easily rewritten as a story than as an expository text.

Readers tended to remember settings, events, and consequences more than other nodes in the narrative structure. They tended to remember setting locations and trajectories, events, statements of problems and solutions, and explanations or attributions best from the expository texts.

Thus, a news story structured in the following manner might be more easily recalled than a typical inverted-pyramid story:

I. Setting: As per the Mandler and Johnson (1978) story grammar, the setting (as opposed to the LEAD of news stories) would introduce the story's protagonist and other characters and give the time and locale of the story, as well as other key information needed to understand subsequent events.

II. Initiating event: The most significant occurrence in the story--the main point, phrased in terms of a problem and solution if appropriate.

III. Tie-in: Explication of the main event--quote, meaning or background of event--how something came to be.

IV. Support for the event: Something to give credibility or significance to main point.

V. Secondary theme (if one needs to be included).

VI. Attributions: Any other details, in order of significance to the lead.

VII. Outcome or consequence of the event(s) detailed in the story. Strong conclusion.

As Berner (1983) has pointed out, not all news stories are suited to being written in a narrative fashion. "The nature of the news," he writes, "is an element in determining the packaging of the news" (p. 39). Thus, the same might be said for rewriting according to an expository text structure. However, when it is possible, it would seem that a structure that incorporates some of the features of the narrative structure or some of the features of the expository/attribu-tion structure along with the traditional and more expedient inverted pyramid structure might result in a greater degree of recall and comprehension of the information conveyed in printed news messages.

One benefit to newspaper readers may be the training of reporters and editors to recognize the type of text structure most suited to a particular topic. Then news stories could be written according to the structure that would best facilitate readers' recall and comprehension, rather than routinely following the inverted pyramid structure that is the norm today.

Nolan (1989) writes that his investigations indicate that

> story forms, be they natural phenomena or not, can be learned and unlearned through socialization. And like many learned things, conscious awareness of their attributes and experience in their use seem to make them more readily usable. (p. 132)

If this is the case, it is possible that instruction in the organization of news stories could also benefit newsreaders in that it might facilitate comprehension of and memory for news, as well as increasing ease of reading. Programs like Newspapers In Education could incorporate instruction about inverted pyramid structure into classroom lessons, thus increasing young readers' ability to assimilate the information in news stories. The effects of such instruction could be measured to assess its usefulness as an educational tool.

The inverted pyramid structure of news was developed mainly as a convenient adaptation to the technical requirements and limitations of the newsroom and the production process. However, as technology advances, the restrictions placed on writers and editors in terms of story length and structure are changing. With the introduction of desktop publishing and electronic pagination of newspapers, the need for last-minute composing-room shortening of stories is decreasing. Computerized newsrooms allow for more creative editing of stories, even on deadline. A reconsideration of the inverted pyramid and its utility as

the basic news structure is in order. The results of this investigation might indicate that the pyramid may no longer be the optimum framework for the printed news message.

APPENDIX A
MEASUREMENT INSTRUMENTS

Questionnaires

Media Use Survey I

1. Do you try to keep up with current events and news items?

   a. Yes

   b. No

2. What is your main source of news?

   a. Television

   b. Newspapers

   c. Radio

   d. News magazines like "Time" or "Newsweek"

   e. Friends and other interpersonal sources

   f. Other (please specify) _____

3. How often would you say you read a newspaper?

   a. Never

   b. Infrequently

   c. Once a week

   d. A few times a week

   e. Daily or more often

Media Use Survey I (continued)

4. How often do you watch television news shows?

   a. Never

   b. Infrequently

   c. Once a week

   d. A few times a week

   e. Daily or more often

5. How often do you listen to radio news broadcasts that are 30 minutes long or longer?

   a. Never

   b. Infrequently

   c. Once a week

   d. A few times a week

   e. Daily or more often

6. Are you interested in keeping up with environmental and wildlife conservation issues?

   a. No, not at all

   b. Not very interested

   c. Fairly interested

   d. Very interested

   e. Extremely interested

7. Which of the following animals are endangered species native to Florida?

   a) the snowy egret

   b) the manatee

   c) the bald eagle

   d) the alligator

   e) the panther

   f) the condor

Media Use Survey I (continued)

8. Which of the following agencies are primarily responsible for the preservation of endangered species in the state of Florida?

   a. The U.S. Fish and Wildlife Service

   b. The Seagrant Extension Program

   c. The Environmental Protection Agency

   d. The Florida Game and Freshwater Fish Commission

   e. The Florida Wildlife Conservation Agency

Media Use Survey II

1. Do you try to keep up with current events and news items?

   a. Yes

   b. No

2. What is your main source of news?

   a. Television

   b. Newspapers

   c. Radio

   d. News magazines like "Time" or "Newsweek"

   e. Friends and other interpersonal sources

   f. Other (please specify) _____

3. How often would you say you read a newspaper?

   a. Never

   b. Infrequently

   c. Once a week

   d. A few times a week

   e. Daily or more often

Media Use Survey II (continued)

4. How often do you watch television news shows?
   a. Never
   b. Infrequently
   c. Once a week
   d. A few times a week
   e. Daily or more often
5. How often do you listen to radio news broadcasts that are 30 minutes long or longer?
   a. Never
   b. Infrequently
   c. Once a week
   d. A few times a week
   e. Daily or more often
6. Are you interested in keeping up with international news events?
   a. No, not at all
   b. Not very interested
   c. Fairly interested
   d. Very interested
   e. Extremely interested

Media Use Survey II (continued)

7. In which of the following countries have violent uprisings occurred in the past twelve months?

a. Rumania
b. Latvia
c. China
d. Albania
e. Argentina
f. Czechoslovakia

8. The name of the current ruler of the South American country of Chile is:

a. Daniel Ortega
b. Juan Esposito
c. Augusto Pinochet
d. Manuel Noriega

Demographic Information

Please provide the following information about yourself by circling the appropriate letter or by writing in the space provided. YOUR NAME SHOULD NOT APPEAR ANYWHERE ON THIS PAGE. Thank you for your assistance with this research.

1. Sex:
   a. Female
   b. Male

2. Age:
   a. 18-24 years old
   b. 25-34 years old
   c. 35-49 years old
   d. 50-64 years old
   e. 65 or older

3. Race:
   a. White
   b. Black
   c. Asian
   d. Hispanic
   e. American Indian
   f. Other

3. What is the highest level of education you have completed?
   a. Some high school
   b. High school diploma
   c. Some college
   d. Associate or vocational degree
   e. Bachelor's degree
   f. Graduate or other professional degree
   g. Other (please specify)

Demographic Information (continued)

4. Please circle your approximate yearly family income:

a. Under $6,000
b. $6,000 to $11,999
c. $12,000 to $17,999
d. $18,000 to $23,999
e. $24,000 to $29,999
f. $30,000 to $35,999
g. $36,000 to $41,999
h. $42,000 to $47,999
i. $48,000 to $53,999
j. $54,000 to $59,999
k. $60,000 or above

Student Survey

1. Some adult students have told us that they have a difficult time getting to school. How did you get to your class (or classes) today? And how long did it take? Please write your answer on the lines below. This information may help us to help you.

2. We need to know how you found out about this educational program. We have tried to inform people about our classes, but are not always successful. Sometimes we miss the students who would like to go to school here. Please tell us how you found out about this program.

3. Adult students have many different needs and reasons for pursuing their education. Briefly, please describe a few of your academic needs and the goals you have set for yourself. If you need additional space, you may use the back of this sheet. Thanks.

Student Survey (continued)

4. A majority of students' knowledge comes from outside the school. Without fail, the media give daily--even constant--news for interested students. Do you gather most of your outside knowledge from radio, TV, or papers? Of the diverse topics presented in media reports--news, sports, features--which holds your interest longest? How much do you get world information from interpersonal sources?

_____

_____

Stimulus Passages Used to Assess Short- and Long-term Recall

Story I

News version

PLAN GIVES BIG CATS BOOST

Breeding program for panthers OK'd

MIAMI (AP)--Ten Florida panthers roaming the wilds of South Florida are about to be chosen for a new life in captivity that may have important consequences for the survival of the endangered species.

A captive-breeding program has been approved by federal and state officials to boost the shrinking panther population from an estimated 30 to 50 in the wild.

"There are certain purists who say, 'Let them die a natural death out in the wild'," said John Christian of the U.S. Fish and Wildlife Service. "We need to consider their views, but on the other hand we are charged with halting the extinction of the species and moving toward its recovery."

"It's no question the population is stressed. When you get down to a total population of 30 to 50 animals, you get to the point of facing the brink of extinction," said Dennis Jordan, Fish and Wildlife's Florida panther coordinator. "We consider we have one viable sustaining population now in South Florida and none anywhere else."

But some wildlife managers say the Florida panther, a type of cougar, is in nowhere near the danger of the

California condor or the black-footed ferret when their entire population was rounded up for captive breeding.

The goal of the new program is 500 breeding adults in captivity and three wild colonies in 20 years using high-tech methods such as radio-telemetry collars and possibly even in vitro techniques.

The nocturnal cats, with adults weighing 60 to 120 pounds, are smaller and darker than most cougars and have a unique tail crook and a cowlick in the middle of their backs.

The panther, which hunts deer and smaller game, is a solitary hunter that needs lots of room--at least 40 square miles for a female and more than 200 square miles for each male, with little overlap.

The panther once ranged from Louisiana to South Carolina, but widespread hunting and urban sprawl have pushed it into the Everglades and the undeveloped center of South Florida.

Without help, experts estimate, the panther will vanish in 25 to 40 years.

Narrative version

AN ARK FOR THE FLORIDA PANTHER

Dennis Jordan frowned at the last entry in his journal: "The population is stressed. When you get down to a total population numbering 30 to 50 animals, you get into a situation of facing the brink of extinction.

"We have one viable sustaining population now in South Florida and none anywhere else."

The Florida panther was Dennis' passion. As the Florida panther coordinator for the U.S. Fish and Wildlife Service, his knowledge of these nocturnal cats included a motley array of facts: Panthers are a smaller and darker subspecies of the cougar, distinguished by their tail crooks and the cowlicks in the middle of their backs. Solitary hunters of deer and small game, they need vast territories--at least 40 square miles for a female and more than 200 for each male, with little overlap. An adult can weigh from 60 to 120 pounds. Panthers once ranged from Louisiana to South Carolina, but relentless hunting and urban sprawl pushed it deep into the Everglades and undeveloped parts of South Florida.

Some wildlife managers, he knew, believed the panther to be in nowhere near the danger of other rare animals like the California condor and the black-footed ferret, whose entire populations were once rounded up for captive

breeding. Some purists thought panthers should be left to die out naturally.

His colleague John Christian often said, "We need to consider their views, but on the other hand we are charged with preventing the extinction of the species and moving toward its recovery."

The plight of the panther angered Dennis; to combat the problem, he had become involved in a captive-breeding program approved by federal and state officials to boost the declining panther population. Ten wild Florida panthers would be chosen for a new life in captivity that might have extraordinary consequences for the survival of the species.

The new program would use high-tech influences such as radio-telemetry collars and possibly even in vitro fertilization to produce 500 breeding adults in captivity and three wild colonies in 20 years.

Without intervention, Dennis knew the Florida panther would vanish in 20 to 40 years.

Expository version

CONSERVATION OF THE FLORIDA PANTHER

This article discusses the endangered status of the Florida panther.

The panther once ranged from Louisiana to South Carolina, but widespread hunting and urban sprawl have pushed it into the Everglades and the undeveloped interior of South Florida.

Without intervention, experts estimate, the panther will disappear in 25 to 40 years.

Some wildlife managers say the Florida panther, a type of cougar, is in nowhere near the danger of the California condor or the black-footed ferret when their entire population was rounded up for captive breeding.

But the population is stressed, according to the U. S. Fish and Wildlife Service's panther coordinator, Dennis Jordan. When a total species population numbers 30 to 50 animals, the species is near extinction. There is one viable sustaining population in South Florida and none elsewhere.

Recently, a captive-breeding program was approved by federal and state officials to boost the declining panther population from an estimated 30 to 50 in the wild.

Ten Florida panthers roaming the wilds of South Florida are about to be chosen for a new life in captivity that may

have extraordinary consequences for the survival of the endangered species.

"There are certain purists who say, 'Let them die a natural death out in the wild'," says John Christian of the U.S. Fish and Wildlife Service. "We need to consider their views, but on the other hand we are charged with preventing the extinction of the species and moving toward its recovery."

The goal of the program is 500 breeding adults in captivity and three wild colonies in 20 years using high-tech influences such as radio-telemetry collars and possibly even in vitro fertilization.

Florida panthers are nocturnal animals, and with adults weighing 60 to 120 pounds, they are smaller and darker than most cougars. They have a distinctive tail crook and a cowlick in the middle of their backs.

The panther, which favors deer and smaller game, is a solitary hunter that needs lots of room--at least 40 square miles for a female and more than 200 square miles for each male, with little overlap.

Story II

News version

SOLDIERS, PROTESTERS CLASH IN SURINAM

PARAMARIBO, SURINAM (UPI)--Soldiers fought through a barricade of pro-democracy demonstrators on the outskirts of the South American city of Paramaribo Monday, injuring about 40 people and allowing a convoy of tanks and trucks to drive into the capital, witnesses said.

An American reporter who saw the confrontation, the first major violence reported in a month of protests, said soldiers and Armed Police paramilitary units with AK-47 assault rifles and truncheons cleared a path through the crowd for the convoy.

Much of the convoy of 72 tanks and 300 trucks, stalled last week by barricades of cars, furniture and demonstrators, drove to a military camp about one mile closer to the center of Paramaribo, the capital of Surinam. Thousands of people rushed the camp's gate and began throwing rocks at windows and soldiers inside, the witness said.

The troop action was the first sign of antagonism from the hard-line Surinam government in almost a month of anti-Communist demonstrations staged by students at Paramaribo University.

At least 40 people were injured in the clash in the south-western suburb of Seguro, the witnesses said.

Parts of the convoy had begun to try to move around the roadblock by a different street but were confronted by thousands of students and workers, witnesses said.

The embattled government posted troops in newspaper offices and placed hospitals on alert Monday in its struggle to regain control of Paramaribo. President Augusto Muniz called the student movement "unpatriotic" and said protestors were "controlled by a small band of agitators who will be suppressed."

The Surinam government faces a growing power struggle between leaders calling for a crackdown on the unrest and those calling for moderation. The situation is likely to worsen in coming weeks before a resolution is reached.

Narrative version (first rewrite)

A TALE OF AN UPRISING

Not very long ago, in a distant land, students and citizens in Paramaribo began to stage demonstrations against their tyrannical government. The government tried to control the protests by despatching a military convoy of 72 tanks and 300 trucks to drive into the capital city, but the convoy was stalled by barricades of cars, furniture and demonstrators.

Eventually--a week later--soldiers succeeded in fighting through a barricade of pro-democracy demonstrators on the outskirts of Paramaribo. A reporter from America who saw the confrontation, the first major violence reported in a month of protests, said soldiers and Armed Police paramilitary units with AK-47 assault rifles and truncheons cleared a path through the crowd for the convoy.

Parts of the convoy had begun to try to move around the roadblock by a different street but were confronted by thousands of students and workers. Nevertheless, much of the convoy drove to a military camp about one mile closer to the center of Paramaribo, the capital of Surinam.

Thousands of people, angered by the military attack, rushed the camp's gate and began throwing rocks at windows and soldiers inside.

At least 40 people were injured in the clash in the south-western suburb of Seguro.

The embattled government struggled to regain control of Paramaribo by posting troops in newspaper offices and placing hospitals on alert. The president of the country, Augusto Muniz, called the student movement "unpatriotic." He said the protestors were "controlled by a small band of agitators who will be suppressed."

The Surinam government is torn by a growing power struggle between leaders calling for a crackdown on unrest and those calling for moderation. The situation is likely to worsen in coming weeks before any resolution is reached.

Expository version (second rewrite)

A POLITICAL DISTURBANCE

This essay describes a political clash in the small South American nation of Surinam.

Soldiers in the capital city of Paramaribo fought through a barricade of pro-democracy demonstrators and allowed a convoy of tanks and trucks to drive into the capital. Four aspects of this struggle were:

1. The clash was the first major violence reported in a month of protests.

2. The troop action was the first sign of antagonism from the hard-line Surinam government in a month of anti-Communist demonstrations staged by students at Paramaribo University.

3. The military convoy's attempt last week to enter the city was stalled by barricades of cars, furniture, and demonstrators.

4. The convoy consisted of 72 tanks and 300 trucks.

An American reporter who saw the confrontation said soldiers and Armed Police paramilitary units with AK-47 assault rifles and truncheons cleared a path through the crowd for the convoy.

Much of the convoy drove to a military camp about one mile closer to the center of Paramaribo.

The next significant event occurred when thousands of people rushed the camp's gate and began throwing rocks at

windows and soldiers inside, the witness said. The result of this attack was that at least 40 people were injured in the clash in the southwestern suburb of Seguro.

Finally, the embattled government struggled to regain control of Paramaribo by (1) posting troops in newspaper offices and (2) placing hospitals on alert on Monday.

In reaction to these events, Surinam President Augusto Muniz called the student movement "unpatriotic" and said protestors were "controlled by a small band of agitators who will be suppressed."

In conclusion, the Surinam government faces a growing power struggle between leaders calling for a crackdown on the unrest and those calling for moderation. The situation is likely to worsen in coming weeks before any resolution is reached.

Stimulus Passages Used to Assess Strength of Text Schema

Narrative passage

THE TRIUMPH OF THE OWL

Once upon a starless midnight, an owl was ensconced, half-slumbering, on the branch of an oak tree when two ground moles attempted to slip by unperceived. "You!" cried the owl. "Who?" quavered the ground moles in utter terror and astonishment, because they could not believe it was possible for anyone to see them in that inky darkness. "You two!" exclaimed the owl. The ground moles hurried away and reported to the other creatures of the pastures and woodlands that the owl was the most omniscient and authoritative of all animals because he had nocturnal vision and because of his uncanny ability to answer any question. "I'll see about that," asserted the secretary bird, and he called on the owl one night when it was again very dark. "How many claws am I holding up?" inquired the secretary bird, and the owl correctly responded, "Two.". "Can you give me another expression meaning 'that is to say' or 'namely'?" questioned the secretary bird; returned the owl, "To wit." "Why does a lover call on his love?" queried the secretary bird; "To woo," replied the owl.

The secretary bird hastily returned to the other creatures and reported that the owl was certainly the most powerful and sagacious animal in the world because of his

extraordinary ability to see in the dark and because he could answer any question, so the creatures despatched a messenger to the owl requesting that he become their sovereign.

Word count: 241

News passage

VLADIMIR HOROWITZ DEAD AT 85

Vladimir Horowitz, whose brilliant technique and emotional profundity led many to consider him the 20th century's greatest pianist, died Sunday at his townhouse on New York City's upper East Side.

Horowitz, 85, suffered a heart attack at about 12:30 p.m., said his manager, Peter Gelb.

"I believe he died of some sort of massive, major heart attack," Gelb said, noting that details would have to come from medical officials.

"Horowitz was undoubtedly the greatest pianist of the 20th century," said Glenn Plaskin, author of "Horowitz," a critical biography published in 1983. "He had more physical energy, more electricity, than any musician that came onto that platform. He was the Greta Garbo of the concert stage."

His last concerts were in western Europe in 1987, Gelb said. He had a studio at his home and shortly before his death he had been at work on a recording of Haydn, Mozart, and Liszt.

Funeral arrangements were uncertain. But Horowitz's wife, Wanda Toscanini, daughter of the late conductor Arturo Toscanini, is believed to want her husband buried in the Toscanini family burial plot in Milan, Italy, Gelb said.

Throughout his life, Horowitz was renowned for his erratic behavior, Plaskin said. Plaskin described him as "temperamental, demanding and a perfectionist. He was extremely charming. He would have loved the attention he's getting now."

Word count: 226

Expository passage

THE SHAMANS OF ANCIENT CULTURES

For thousands of years man thought that everything around him--trees, streams, rocks--contained a spirit which could be either beneficent (good) or bad. Even sophisticated ancient Greeks believed in wood nymphs.

When man first dwelt in caves or primitive shelters, he became interested in the spirits of the sky and earth and how to stop them from causing harm to individuals or groups. The first problem was how to talk with the spirits. Enter the shaman.

The term shaman began among the Mongol-type peoples of eastern Siberia, and it may be related to their word meaning ascetic.

Cave paintings, carved bones, and other artifacts show that shamanism was widespread at least twenty thousand years ago. Surviving forms are seen among Siberians, Polynesians, Eskimos, and American Indians. The close resemblance in many rituals raises the question of whether practices arose spontaneously in many regions or whether they were spread by prehistoric migration.

Sometimes shamans inherit their vocation but more often they are "called" by spirits. This may occur at any time from birth to manhood and is recognized by some dramatic situation. To be struck by lightning is a particularly powerful sign; other clear signs occur when a tree is struck

and gushes forth water or when a bird or animal appears to call the individual by name.

Abnormal behavior is commonly accepted as proof of shamanism.

Word count: 228

APPENDIX B
SCORING SHEETS

Parsed Versions of Stimulus Passages for Recall Measure

Story I

News version

1. LEAD: Ten Florida panthers roaming the wilds of South Florida are about to be chosen for a new life in captivity that may have important consequences for the survival of the endangered species.

2. TIE-IN: A captive-breeding program has been approved by federal and state officials to boost the shrinking panther population from an estimated 30 to 50 in the wild.

3. ELABORATION OF LEAD: "There are certain purists who say, 'Let them die a natural death out in the wild'," said John Christian of the U.S. Fish and Wildlife Service. "We need to consider their views, but on the other hand we are charged with halting the extinction of the species and moving toward its recovery."

4. SUPPORT FOR THE LEAD: "It's no question the population is stressed. When you get down to a total population of 30 to 50 animals, you get to the point of facing the brink of extinction," said Dennis Jordan, Fish

and Wildlife's Florida panther coordinator. "We consider we have one viable sustaining population now in South Florida and none anywhere else."

5. BACKGROUND: But some wildlife managers say the Florida panther, a type of cougar, is in nowhere near the danger of the California condor or the black-footed ferret when their entire population was rounded up for captive breeding.

6. DEVELOPMENT OF THE MAIN IDEA: The goal of the program is 500 breeding adults in captivity and three wild colonies in 20 years using high-tech methods such as radio-telemetry collars and possibly even in vitro techniques.

7. DETAILS: The nocturnal cats, with adults weighing 60 to 120 pounds, are smaller and darker than most cougars and have a unique tail crook and a cowlick in the middle of their backs.

The panther, which hunts deer and smaller game, is a solitary hunter that needs lots of room--at least 40 square miles for a female and more than 200 square miles for each male, with little overlap.

The panther once ranged from Louisiana to South Carolina, but widespread hunting and urban sprawl have pushed it into the Everglades and the undeveloped center of South Florida.

Without help, experts estimate, the panther will vanish in 25 to 40 years.

Narrative version

1. SETTING: Dennis Jordan frowned at the last entry in his journal: "The population is stressed. When you get down to a total population numbering 30 to 50 animals, you get into a situation of facing the brink of extinction.

"We have one viable sustaining population now in South Florida and none anywhere else."

The Florida panther was Dennis' passion. As the Florida panther coordinator for the U.S. Fish and Wildlife Service, his knowledge of these nocturnal cats included a motley array of facts: Panthers are a smaller and darker subspecies of the cougar, distinguished by their tail crooks and the cowlicks in the middle of their backs. Solitary hunters of deer and small game, they need vast territories--at least 40 square miles for a female and more than 200 for each male, with little overlap. An adult can weigh from 60 to 120 pounds

2. EVENT: Panthers once ranged from Louisiana to South Carolina, but relentless hunting and urban sprawl pushed it deep into the Everglades and undeveloped parts of South Florida.

3. INTERNAL REACTION: Some wildlife managers, he knew, believed the panther to be in nowhere near the danger of other rare animals like the California condor and the black-footed ferret, whose entire populations were once rounded up

for captive breeding. Some purists thought panthers should be left to die out naturally.

His colleague John Christian often said, "We need to consider their views, but on the other hand we are charged with preventing the extinction of the species and moving toward its recovery."

The plight of the panther angered Dennis;

a) GOAL: to combat the problem

b) ATTEMPT: he had become involved in a captive-breeding program approved by federal and state officials to boost the declining panther population

5. OUTCOME: Ten wild Florida panthers would be chosen for a new life in captivity that might have extraordinary consequences for the survival of the species.

The new program would use high-tech influences such as radio-telemetry collars and possibly even in vitro fertilization to produce 500 breeding adults in captivity and three wild colonies in 20 years.

6. CONSEQUENCE/ENDING: Without intervention, Dennis knew the Florida panther would vanish in 20 to 40 years.

Expository version

CONSERVATION OF THE FLORIDA PANTHER

1. TOPIC SENTENCE (Problem): This article discusses the endangered status of the Florida panther.

2. SETTING TRAJECTORY: The panther once ranged from Louisiana to South Carolina, but widespread hunting and urban sprawl have pushed it into the Everglades and the undeveloped interior of South Florida.

3. EXPLANATION: Without intervention, experts estimate, the panther will disappear in 25 to 40 years.

4. SPECIFIC: Some wildlife managers say the Florida panther, a type of cougar, is in nowhere near the danger of the California condor or the black-footed ferret when their entire population was rounded up for captive breeding.

But the population is stressed, according to the U. S. Fish and Wildlife Service's panther coordinator, Dennis Jordan. When a total species population numbers 30 to 50 animals, the species is near extinction. There is one viable sustaining population in South Florida and none elsewhere.

5. SPECIFIC (Solution): Recently, a captive-breeding program was approved by federal and state officials to boost the declining panther population from an estimated 30 to 50 in the wild.

Ten Florida panthers roaming the wilds of South Florida are about to be chosen for a new life in captivity that may

have extraordinary consequences for the survival of the endangered species.

6. EXPLANATION: "There are certain purists who say, 'Let them die a natural death out in the wild'," says John Christian of the U.S. Fish and Wildlife Service. "We need to consider their views, but on the other hand we are charged with preventing the extinction of the species and moving toward its recovery."

7. SPECIFIC: The goal of the program is 500 breeding adults in captivity and three wild colonies in 20 years using high-tech influences such as radio-telemetry collars and possibly even in vitro fertilization.

8. ATTRIBUTION: Florida panthers are nocturnal animals, and with adults weighing 60 to 120 pounds, they are smaller and darker than most cougars. They have a distinctive tail crook and a cowlick in the middle of their backs.

The panther, which favors deer and smaller game, is a solitary hunter that needs lots of room--at least 40 square miles for a female and more than 200 square miles for each male, with little overlap.

Story II

News version

1. LEAD: Soldiers fought through a barricade of pro-democracy demonstrators on the outskirts of the South American city of Paramaribo Monday, injuring about 40 people and allowing a convoy of tanks and trucks to drive into the capital, witnesses said.

2. TIE-IN: An American reporter who saw the confrontation, the first major violence reported in a month of protests, said soldiers and Armed Police paramilitary units with AK-47 assault rifles and truncheons cleared a path through the crowd for the convoy.

3. ELABORATION ON THE MAIN POINT: Much of the convoy of 72 tanks and 300 trucks, stalled last week by barricades of cars, furniture and demonstrators, drove to a military camp about one mile closer to the center of Paramaribo, the capital of Surinam. Thousands of people rushed the camp's gate and began throwing rocks at windows and soldiers inside, the witness said.

4. SUPPORT FOR THE LEAD: The troop action was the first sign of antagonism from the hard-line Surinam government

5. BACKGROUND: in almost a month of anti-Communist demonstrations staged by students at Paramaribo University.

6. DEVELOPMENT OF THE MAIN IDEA: At least 40 people were injured in the clash in the south-western suburb of Seguro, the witnesses said.

Parts of the convoy had begun to try to move around the roadblock by a different street but were confronted by thousands of students and workers, witnesses said.

7. DETAILS: The embattled government posted troops in newspaper offices and placed hospitals on alert Monday in its struggle to regain control of Paramaribo. President Augusto Muniz called the student movement "unpatriotic" and said protestors were "controlled by a small band of agitators who will be suppressed."

The Surinam government faces a growing power struggle between leaders calling for a crackdown on the unrest and those calling for moderation. The situation is likely to worsen in coming weeks before a resolution is reached.

Narrative version

1. SETTING: Not very long ago, in a distant land, students and citizens in Paramaribo began to stage demonstrations against their tyrannical government. The government tried to control the protests by despatching a military convoy of 72 tanks and 300 trucks to drive into the capital city, but the convoy was stalled by barricades of cars, furniture and demonstrators.

2. EVENT I: Eventually--a week later--soldiers succeeded in fighting through a barricade of pro-democracy demonstrators on the outskirts of Paramaribo. A reporter from America who saw the confrontation, the first major violence reported in a month of protests, said soldiers and Armed Police paramilitary units with AK-47 assault rifles and truncheons cleared a path through the crowd for the convoy.

3. EVENT II: Parts of the convoy had begun to try to move around the roadblock by a different street but were confronted by thousands of students and workers. Nevertheless, much of the convoy drove to a military camp about one mile closer to the center of Paramaribo, the capital of Surinam.

4. INTERNAL REACTION: Thousands of people, angered by the military attack,

5. ATTEMPT: rushed the camp's gate and began throwing rocks at windows and soldiers inside.

6. OUTCOME: At least 40 people were injured in the clash in the south-western suburb of Seguro.

7. CONSEQUENCE/ENDING: The embattled government struggled to regain control of Paramaribo by posting troops in newspaper offices and placing hospitals on alert. The president of the country, Augusto Muniz, called the student movement "unpatriotic." He said the protestors were "controlled by a small band of agitators who will be suppressed."

The Surinam government is torn by a growing power struggle between leaders calling for a crackdown on unrest and those calling for moderation. The situation is likely to worsen in coming weeks before any resolution is reached.

Expository version

1. SETTING LOCATION: This essay describes a political clash in the small South American nation of Surinam.

2. EXPLANATION: Soldiers in the capital city of Paramaribo fought through a barricade of pro-democracy demonstrators and allowed a convoy of tanks and trucks to drive into the capital.

3. SPECIFIC: Four aspects of this struggle were:

1) The clash was the first major violence reported in a month of protests.

2) The troop action was the first sign of antagonism from the hard-line Surinam government in a month of anti-Communist demonstrations staged by students at Paramaribo University.

3) The military convoy's attempt last week to enter the city was stalled by barricades of cars, furniture, and demonstrators.

4) The convoy consisted of 72 tanks and 300 trucks.

An American reporter who saw the confrontation said soldiers and Armed Police paramilitary units with AK-47 assault rifles and truncheons cleared a path through the crowd for the convoy.

4. SETTING TRAJECTORY: Much of the convoy drove to a military camp about one mile closer to the center of Paramaribo.

5. SPECIFIC (Covariance): (1) Antecedent:The next significant event occurred when thousands of people rushed the camp's gate and began throwing rocks at windows and soldiers inside, the witness said.

(2) Consequent:The result of this attack was that at least 40 people were injured in the clash in the southwestern suburb of Seguro.

6. SPECIFIC: Finally, the embattled government struggled to regain control of Paramaribo by (1) posting troops in newspaper offices and (2) placing hospitals on alert on Monday.

7. SPECIFIC: In reaction to these events, Surinam President Augusto Muniz called the student movement "unpatriotic" and said protestors were "controlled by a small band of agitators who will be suppressed."

8. EVIDENCE: In conclusion, the Surinam government faces a growing power struggle between leaders calling for a crackdown on the unrest and those calling for moderation.

9. SPECIFIC: The situation is likely to worsen in coming weeks before any resolution is reached.

Parsed Versions of Stimulus Passages Used to Measure Strength of Text Schema

Parsing of "The Triumph of the Owl"

1. SETTING: Once upon a starless midnight, an owl was ensconced, half-slumbering, on the branch of an oak tree

2. EVENT I: when two ground moles attempted to slip by unperceived. "You!" cried the owl.

3. INTERNAL REACTION: "Who?" quavered the ground moles in utter terror and astonishment, because they could not believe it was possible for anyone to see them in that inky darkness. "You two!" exclaimed the owl.

4. EVENT II: The ground moles hurried away and reported to the other creatures of the pastures and woodlands that the owl was the most omniscient and authoritative of all animals because he had nocturnal vision and because of his uncanny ability to answer any question.

5. INTERNAL REACTION (complex):

GOAL: "I'll see about that," asserted the secretary bird,

ATTEMPT: and he called on the owl one night when it was again very dark. "How many claws am I holding up?" inquired the secretary bird, and the owl correctly responded, "Two." "Can you give me another expression meaning 'that is to say' or 'namely'?" questioned the secretary bird; returned the owl, "To wit." "Why does a

lover call on his love?" queried the secretary bird; "To woo," replied the owl.

6. OUTCOME: The secretary bird hastily returned to the other creatures and reported that the owl was certainly the most powerful and sagacious animal in the world because of his extraordinary ability to see in the dark and because he could answer any question,

7. CONSEQUENCE: so the creatures despatched a messenger to the owl requesting that he become their sovereign.

Parsing of "Vladimir Horowitz Dead at 85"

1. LEAD: Vladimir Horowitz, whose brilliant technique and emotional profundity led many to consider him the 20th century's greatest pianist, died Sunday at his townhouse on New York City's upper East Side.

2. TIE-IN: Horowitz, 85, suffered a heart attack at about 12:30 p.m., said his manager, Peter Gelb.

3. ELABORATION OF LEAD: "I believe he died of some sort of massive, major heart attack," Gelb said, noting that details would have to come from medical officials.

4. SUPPORT FOR THE LEAD: "Horowitz was undoubtedly the greatest pianist of the 20th century," said Glenn Plaskin, author of "Horowitz," a critical biography published in 1983. "He had more physical energy, more electricity, than any musician that came onto that platform. He was the Greta Garbo of the concert stage."

5. BACKGROUND: His last concerts were in western Europe in 1987, Gelb said. He had a studio at his home and shortly before his death he had been at work on a recording of Haydn, Mozart, and Liszt.

6. DEVELOPMENT OF THE MAIN IDEA: Funeral arrangements were uncertain. But Horowitz's wife, Wanda Toscanini, daughter of the late conductor Arturo Toscanini, is believed to want her husband buried in the Toscanini family burial plot in Milan, Italy, Gelb said.

7. DETAILS: Throughout his life, Horowitz was renowned for his erratic behavior, Plaskin said. Plaskin described him as "temperamental, demanding and a perfectionist. He was extremely charming. He would have loved the attention he's getting now."

Parsing of "The Shamans of Ancient Cultures

1. TOPIC SENTENCE: For thousands of years man thought that everything around him--trees, streams, rocks--contained a spirit which could be either beneficent (good) or bad.

2. SPECIFIC: Even sophisticated ancient Greeks believed in wood nymphs.

3. EXPLANATION: When man first dwelt in caves or primitive shelters, he became interested in the spirits of the sky and earth and how to stop them from causing harm to individuals or groups.

4. PROBLEM: The first problem was how to talk with the spirits.

5. SOLUTION: Enter the shaman.

6. SPECIFIC (Setting location): The term shaman began among the Mongol-type peoples of eastern Siberia, and it may be related to their word meaning ascetic.

7. SPECIFIC (Evidence): Cave paintings, carved bones, and other artifacts show that shamanism was widespread at least twenty thousand years ago.

8. SPECIFIC: Surviving forms are seen among Siberians, Polynesians, Eskimos, and American Indians.

9. SPECIFIC: The close resemblance in many rituals raises the question of whether practices arose spontaneously in many regions or whether they were spread by prehistoric migration.

10. ATTRIBUTION: Sometimes shamans inherit their vocation but more often they are "called" by spirits.

11. SPECIFIC: This may occur at any time from birth to manhood and is recognized by some dramatic situation.

12. SPECIFIC: To be struck by lightning is a particularly powerful sign; other clear signs occur when a tree is struck and gushes forth water or when a bird or animal appears to call the individual by name.

13. SPECIFIC: Abnormal behavior is commonly accepted as proof of shamanism.

APPENDIX C
SCORING PROCEDURES

Example of Scoring Procedure for Recall ProtocolsSample Subject Free Recall of Narrative Version of Story I

(The subject's recalled protocols are transcribed exactly from the original).

Dennis was bothered by the decline of the Florida panther. When there's only 40-60 (panthers) of a species left, extinction is not far away. He decided to make it his project. Some people thought that the panther should just "naturally" die off. Though they used to be found throughout Florida and up to Louisiana, overhunting and urbanization has forced the panther to retreat to the remote Everglades.

A panther is a solitaire hunter (deer) and needs (some number) acres (sq. miles?) to roam in. Weight between 60-140 lbs. A captive population is being kept. The Florida panther is different from the cougar by a crimp in the tail and a dark cowlick. 10? more may be introduced into Florida rural areas.

In vitro fertilization along with captive breeding will be used to help save the Florida panther.

Scoring System

The recalled protocol was compared to the parsed version of the original stimulus passage (see Appendix B) and the number of sentences remembered from each terminal node in the text structure was noted. If less than half of the original sentence was remembered, the sentence was not counted as having been recalled. If about half of the sentence was remembered, it was counted as 0.5. If more than half of the sentence was remembered, it was counted as one sentence.

Thus, in the above passage, the first sentence the subject wrote was "Dennis was bothered by the decline of the Florida panther." This is not very similar to any sentence in the original passage, although the protagonists in the story--Dennis Jordan and the Florida panther--are named. Therefore, this subject was given 0.5 for partial recall of a sentence from the first node (the SETTING).

The second sentence is, "When there's only 40-60 (panthers) of a species left, extinction is not far away." This is very similar to the sentence in the setting reading, "When you get down to a total population numbering 30 to 50 animals, you get into a situation of facing the brink of extinction." The subject did not remember the numbers exactly, but the figures were close enough to the originals to be considered correct. Thus, the subject was also given credit for remembering a full sentence from the first node (1.0).

"He decided to make it his project." This does not have a parallel in the story and was not counted.

"Some people thought that the panther should just 'naturally' die off." This is very similar to the sentence in the third node--the INTERNAL REACTION--reading, "Some purists thought panthers should be left to die out naturally." The subject was given credit for one full sentence remembered from this node (1.0 for Node 3).

"Though they used to be found throughout Florida and up to Louisiana, overhunting and urbanization has forced the panther to retreat to the remote Everglades." This sentence is very close to the EVENT: "Panthers once ranged from Louisiana to South Carolina, but relentless hunting and urban sprawl pushed it deep into the Everglades and undeveloped parts of South Florida." The subject was given credit for remembering this sentence (1.0 for Node 2).

The subject's next sentence was, "The panther is a solitaire hunter (deer) and needs (some number) acres (sq. miles?) to roam in." This indicates partial recall of the sentence in the SETTING reading, "Solitary hunters of deer and small game, they need vast territories--at least 40 square miles for a female and 200 for a male, with little overlap." The subject was given 0.5 for this sentence (0.5 for Node 1).

"Weight 60-140 lbs." This corresponds to the sentence in the original reading, "An adult can weigh from 60 to 120 pounds." Full credit for this sentence (1.0 for Node 1).

"A captive population is being kept." This sentence is unclear and not apparent in the original, so it isn't counted.

"The Florida panther is difference from the cougar by a crimp in the tail and dark cowlick." This is part of a sentence contained in the original story that reads, "Panthers are a smaller and darker subspecies of the cougar, distinguished by their tail crooks and the cowlicks in the middle of their backs." So the subject is given 0.5 for this sentence. Again, this sentence is taken from the SETTING (0.5 for Node 1).

"Ten more may be introduced into rural areas." No credit.

"In vitro fertilization along with captive breeding will be used to help save the Florida panther."

The subject was given credit for partially remembering a sentence from the fifth node (the OUTCOME).

The subject's recall score is written down as follows:

Node 1. SETTING: 0.5 + 1.0 + 0.5 + 1.0 + 0.5 = 3.5

Node 2. EVENT: 1.0 = 1.0

Node 3. INTERNAL REACTION: 1.0 = 1.0

Node 4. GOAL: 0

Node 5. ATTEMPT: 0

Node 6. OUTCOME: 0.5 = 0.5

Node 7. CONSEQUENCE: 0

The proportion of each node recalled is then computed. This is done by calculating the proportion of sentences recalled by the subject out of the total number of sentences in that node in the original story, as shown below:

Node 1. SETTING: 3.5/6 = 0.58

Node 2. EVENT: 1.0/1.0 = 1.00

Node 3. INTERNAL REACTION: 1.0/4 = 0.25

Node 4. GOAL: 0

Node 5. ATTEMPT: 0

Node 6. OUTCOME: 0.5/2 = 0.25

Node 7. CONSEQUENCE: 0

The total number of nodes remembered by the subject is thus 0.58 + 1.00 + 0.25 + 0.25 = 2.08. The subject remembered 2.08 out of 7 nodes, so her total recall score is 2.08/7 = .02971. Converted to a percentage and rounded to the nearest whole number, this is a recall score of 30%.

Example of Scoring Procedure for Strength of Text Schema Measure

Sample Subject Reordering of Scrambled News Stimulus Passage

1. Vladimir Horowitz, whose brilliant technique and emotional profundity led many to consider him the 20th century's greatest pianist, died Sunday at his townhouse on New York City's upper East Side.

2. Horowtiz, 85, suffered a heart attack at about 12:30 p.m., said his manager, Peter Gelb.

3. "I believe he died of some sort of massive, major heart attack," Gelb said, noting that details would have to come from medical officials.

4. Throughout his life, Horowitz was renowned for his erratic behavior, Plaskin said. Plaskin described him as "temperamental, demanding and a perfectionist. He was extremely charming. He would have loved the attention he's getting now."

5. His last concerts were in western Europe in 1987, Gelb said. He had a studio at his home and shortly before his death he had been at work on a recording of Haydn, Mozart and Liszt.

6. Horowitz was undoubtedly the greatest pianist of the 20th century," said Glenn Plaskin, author of "Horowitz," a critical biography published in 1983. "He had more physical energy, more electricity, than any musician that came onto

that platform. He was the Greta Garbo of the concert stage."

7. Funeral arrangements were uncertain. But Horowitz's wife, Wanda Toscanini, daughter of the late conductor Arturo Toscanini, is believed to want her husband buried in the Toscanini family burial plot in Milan, Italy.

This sequencing of the parsed nodes was compared to the ordering of the same nodes in the original version (see Appendix B).

It will be seen that the subject's rankings of the nodes compare to the originals as shown below:

SUBJECT	ORIGINAL	D' SCORE	D' SCORE SQUARED
1	1	0	0
2	2	0	0
3	3	0	0
7	4	3	9
5	5	0	0
4	6	2	4
6	7	1	1
		Total	14

D' scores were computed by calculating the difference between the ranks of the nodes in the subject's version of the story and the original version. A d' score for each

node was thus computed. These scores were squared to increase the variance and the sum of the squared d' scores was calculated.

The sum of the squared d' scores was used to calculate the rank-order correlation coefficient for the subject using the formula for the Spearman's rho:

$$r_s = 1-[6 \sum_i D_i^2 /N(N^2 - 1)]$$

The subject's score in the above example would thus be

$$1-[6 \times 14/7(49-1)] = 1-[84/336] = 1-0.25 = 0.75.$$

Converting to a percentage, the subject's "strength of text schema" score is 75%.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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